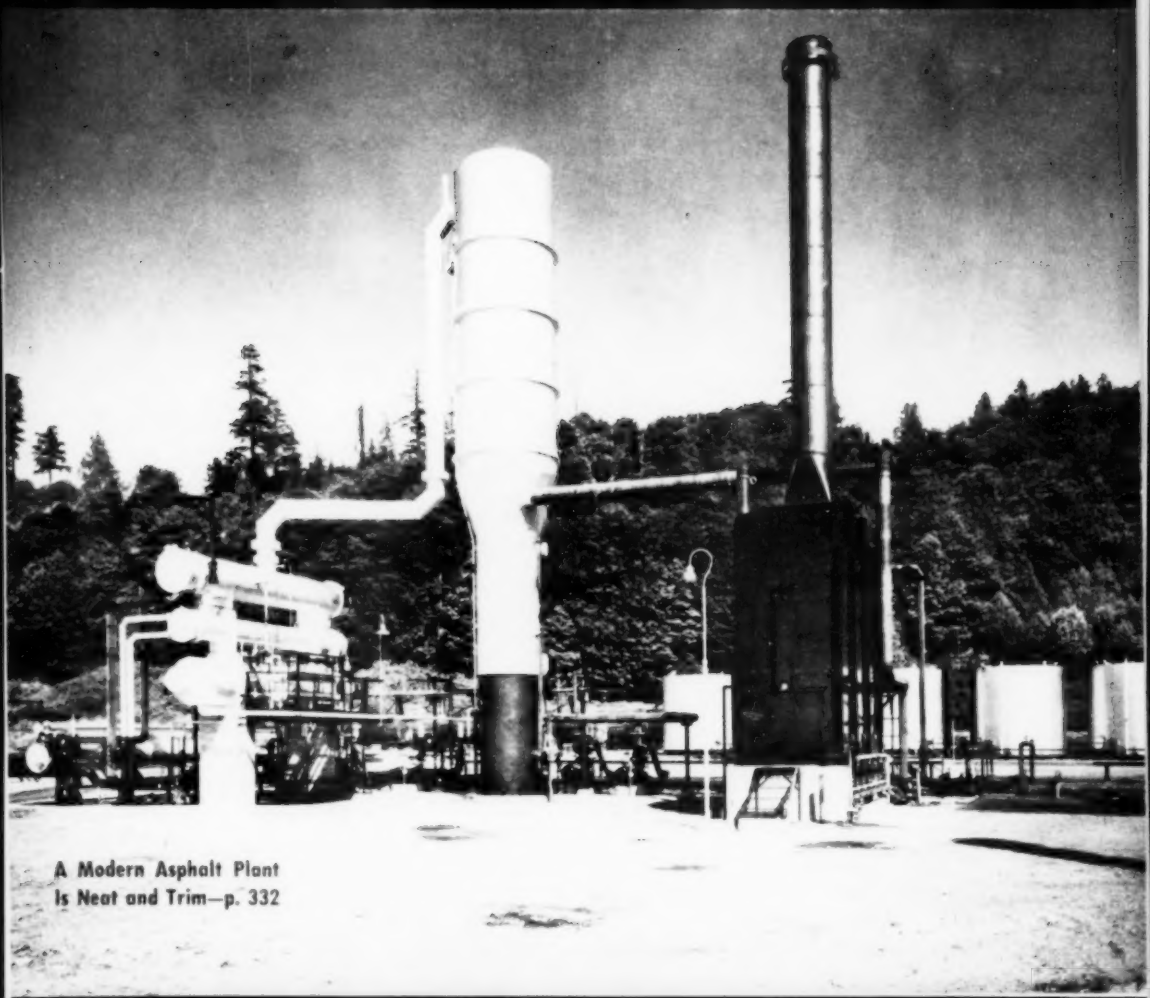
MARCH, 1952
VOL. 7, NO. 3

PETROLEUM PROCESSING



A Modern Asphalt Plant
Is Neat and Trim—p. 332

Another HUDSON-BUILT PLANT

Processing 65 Million Cubic Feet of Gas Per Day In the *Dollarhide Field*

This plant, the most recent of the more than 100 major projects completed by HUDSON, processes all the gas produced in the Dollarhide oil field of Andrews County in West Texas. The gas is compressed to 650 pounds per square inch and treated to remove Hydrogen Sulphide, after which about half of the gas is used for gas lift, and half processed for removal of at least 75% of the propane and essentially 100% of the butanes and natural gasoline.

The plant was designed and constructed by HUDSON in collaboration with engineers of The Pure Oil Company.

HUDSON
ENGINEERING CORPORATION
FAIRVIEW STATION • HOUSTON, TEXAS

We applied the "strip-tease" principle to dealer education

Oil company executives who have seen Ethyl's "Product Sales Clinic" say that it gives more real sales-building information than anything of its kind. This new show was developed to help you carry out your dealer-education program. Its purpose is to give service station personnel a working knowledge of engines, fuels, lubricants and TBA items.

As you know, dealer education is at best a difficult and laborious task. Textbooks and pamphlets seldom get careful study, even though they are attractively illustrated and diagramed. And you know how during long meetings even the best of upholstered chairs get hard. Men start to fidget and wish themselves out.

We believe one solution to the dealer-education problem is "showmanship."

continued on next page

ETHYL
ETHYL CORPORATION

We applied the "strip-tease" principle to dealer education

continued from preceding page

So in our Clinic we employ basic theatre techniques, one of which is the "strip-tease" principle. Giant models of an engine, a carburetor and a distributor are stripped down to show the how and why of their operations.

Other interest-holding ideas are an unusual use of black light and fluorescent paints . . . dramatic demonstrations of such subjects as knock and oil contamination . . . and a "talking" engine operated on various fuels while big dials tell the different stories of speed, power and heat.

Several units of the "Product Sales Clinic" are now working full time. And plans are being made to expand this service to meet the demands of the industry.

ETHYL CORPORATION

NEW YORK 17, NEW YORK

Ethyl service is backed by 28 years of antiknock experience

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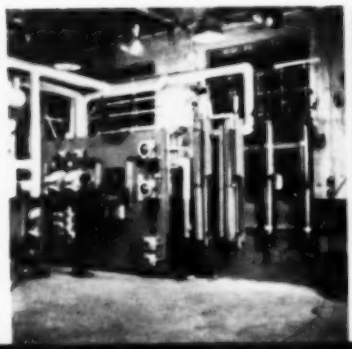
FUEL RESEARCH

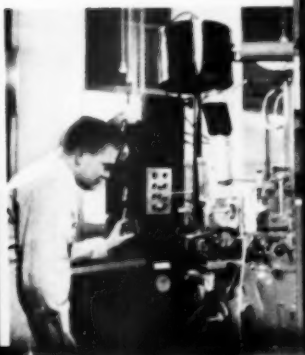
ROAD RATINGS INDOORS

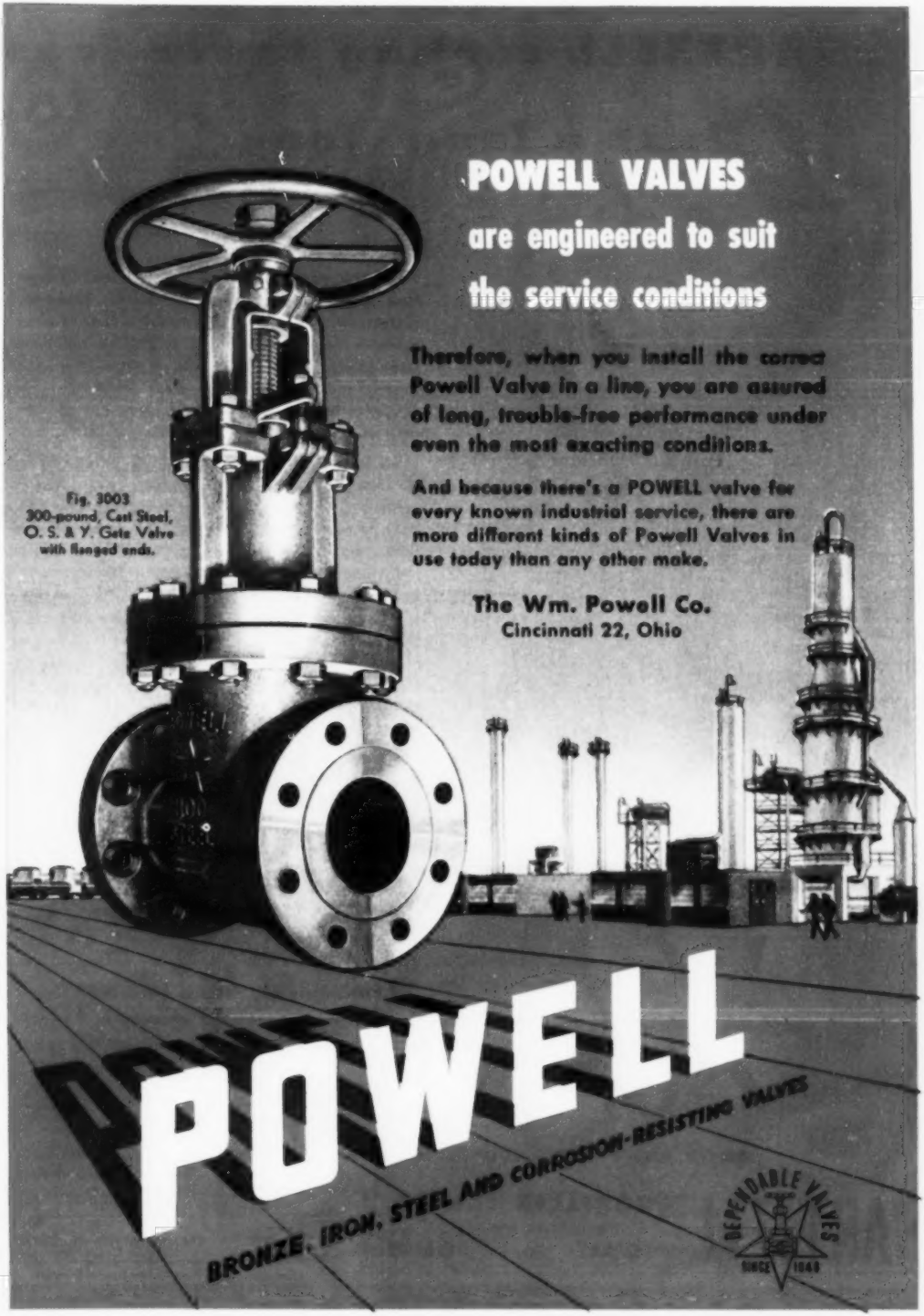
PREMIUM GASOLINE PROMOTION

SAFETY SERVICE

GASOLINE TESTING



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the service conditions
Therefore, when you install the correct Powell Valve in a line, you are assured of long, trouble-free performance under even the most exacting conditions.
And because there's a POWELL valve for every known industrial service, there are more different kinds of Powell Valves in use today than any other make.
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300-pound, Cast Steel,
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with flanged ends.
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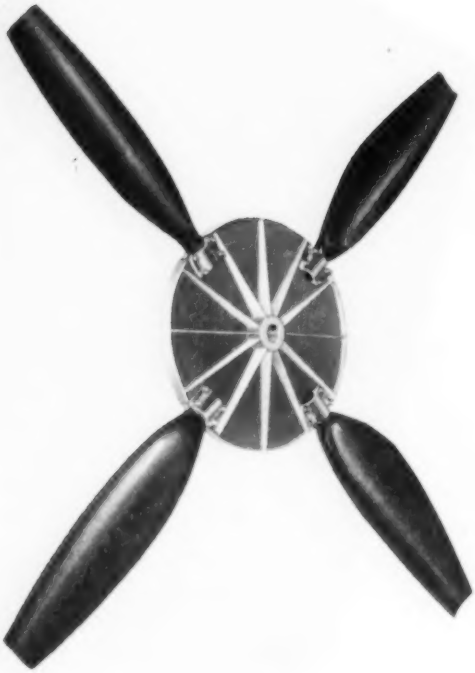
DEPENDABLE VALVES
SINCE 1843

HARTZELL cooling tower fans last a long, long time*



12' adjustable four-blade fan. Blades of Hartzite plastic.

6' adjustable six-blade fan. Blades of aluminum alloy.

The blade materials in all Hartzell cooling tower fans are chosen to resist the specific destructive factors which will be encountered in fans of a certain size. Smaller size fans (3' to 9') have aluminum alloy blades to provide maximum physical strength in a smaller blade. And on these smaller fans the cast aluminum hub gives a combination of lightness and strength.

For larger size fans (10' to 22') the blades are of Hartzite plastic — with an amazing resistance to corrosion, vibration, abrasion and so on. You don't have to worry about moisture and most chemical fumes damaging Hartzite blades. And ability to withstand vibration is especially important in these larger fans. Even when travelling at high speeds Hartzite blades don't develop major faults because of surface nicks or scratches. (This feature also prevents the tremendous strain on your motor and motor coupling which would be caused by a blade fault.) No other fan blade gives you this continued protection against *all* of these deteriorating factors.

We say *continued* protection because these features will be just as true of your Hartzell fan years from now as they are today. Hartzite blades are solid reinforced plastic and there's no danger that bumps and scratches will permit corrosion even years later. As many a present Hartzell fan owner will tell you . . . Hartzell cooling tower fans last a long, long time.

*Practically all Hartzite units installed since Hartzite was originated in 1941 are operating satisfactorily today.

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Covering petroleum research and the design, management, operation and maintenance of plants processing hydrocarbon materials into fuels, lubricants and chemicals

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Platt's Oilgram News and Platt's Oilgram Prices
A daily independent oil-news and oil-price reporting service issued from New York, Cleveland, Houston

March 1952
Vol. 7, No. 3

Contents

Feature Articles

Industry's Figures vs. Bureau's Figures 321
NPC brands Bureau's 12 cents per gallon estimate for gasoline from coal as "fictitious, misleading"

Five Ways Instruments Pay 324
Refiner finds savings in labor, utilities, maintenance, and product quality and safety improvement

Meeting Product Quality in Wax Crystallization 326
Photomicrography aids study of crystal form and type as affecting strength, melt point, hardness, permeability, *by H. A. Lund*

Modern Asphalt Refinery—Neat and Trim 332
New 3,500 b. d plant of Stancal Asphalt and Bitumals Co. proves asphalt making isn't necessarily messy

Sulfur from Industrial Gases 333
They contain more than enough to overcome shortages—and here's how they're handled, *by Paul Zurcher*

Cost of Recovering Sulfur from Gases 338
Up-to-date facts and figures show that even a 5 ton/day recovery can be made o pay for itself, *by J. L. Parker*

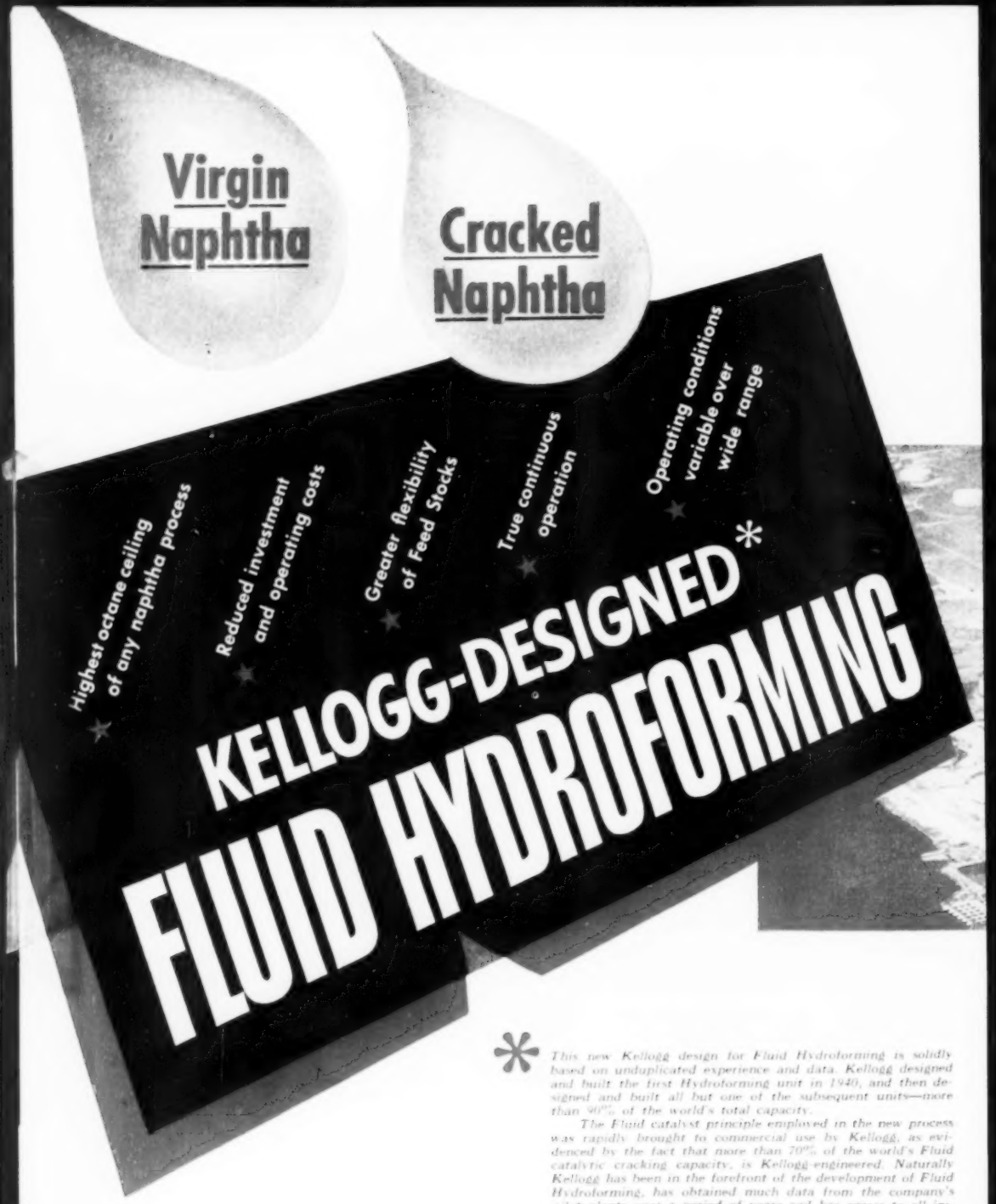
Valves and Drums as Good as New 340
Sinclair uses "production line" techniques in successful salvaging operations at their Houston refinery, *by C. N. Vallette*

Continuous Contact Coking of Heavy Feed 348
Yield and product distribution from operations with 4 gravity asphalt, *by E. R. Smoley and A. H. Schutte*

Take Another Look at Coke 351
Demand for metallurgical grades is growing faster than refiners can supply it—at $21 ton and up

Departments

What's Happening	271	Books	375
Tomorrow	275	Meetings	379
Letters	278	Refining Trends	381
Plant Practices	353	Advertisers' Index	384
Processing Patents	363	What's New	385
Equipment Patents	369	Personals	397
News of Suppliers	373	Editorials	400



* *This new Kellogg design for Fluid Hydroforming is solidly based on unduplicated experience and data. Kellogg designed and built the first Hydroforming unit in 1940, and then designed and built all but one of the subsequent units—more than 90% of the world's total capacity.*

The Fluid catalyst principle employed in the new process was rapidly brought to commercial use by Kellogg, as evidenced by the fact that more than 70% of the world's Fluid catalytic cracking capacity, is Kellogg-engineered. Naturally Kellogg has been in the foretront of the development of Fluid Hydroforming, has obtained much data from the company's pilot plants over a period of years and has access to all important data pertaining to the subject.

True Continuous Operation . . .

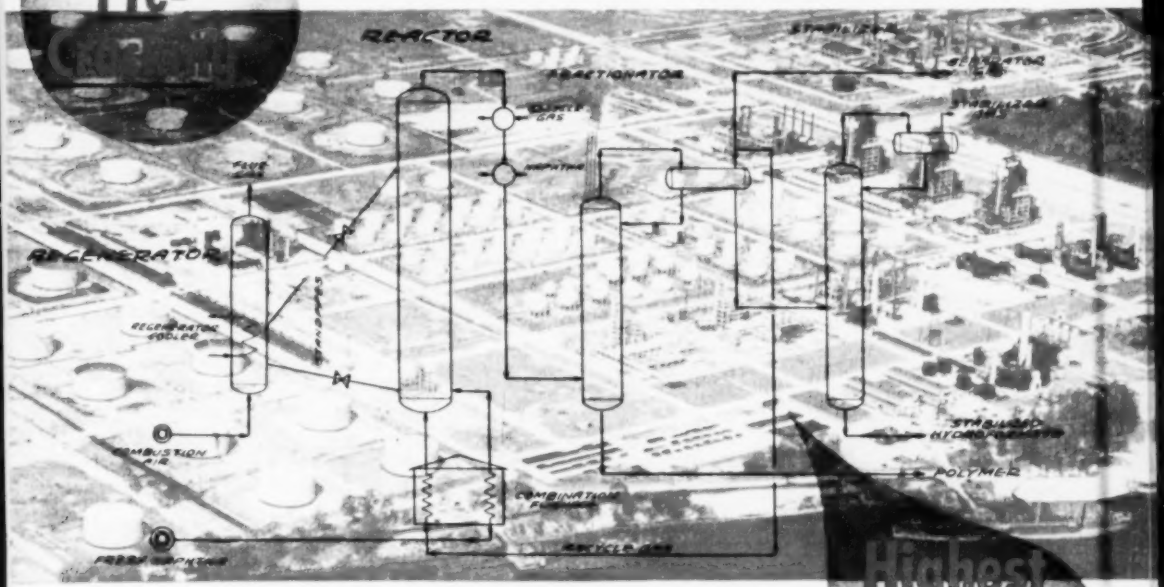
Reduced Pre-

A truly continuous process, *Fluid* Hydroforming stands today as possibly the most important single refining development since Fluid catalytic cracking.

Fluid Hydroforming offers the refiner a naphtha upgrading process at considerably reduced investment cost in comparison with conventional fixed-bed reforming processes. Its operating cost is lower. But probably most important is the fact that Kellogg Fluid Hydroforming has a higher octane "ceiling" than any other process of its kind, principally because of its continous regeneration feature.

Fluid Hydroforming is adaptable to a wider range of feeds than other naphtha processes. Feed stocks ranging from hexane (for benzene production) to kerosene can be employed if desired.

The process can be employed effectively to upgrade virgin heavy naphthas, and is especially effective on high-sulfur cracked naphthas or a mixed virgin and cracked feed.



Highest Octane Ceiling

New Kellogg-Designed Fluid Hydroforming Units in Work

- ★ **2,000 BPD UNIT** for Gulf Coast refiner to upgrade straight run naphthas to produce aviation stock
- ★ **10,000 BPD UNIT** for mid-western refiner to upgrade mixture of virgin naphthas with alternate operation on pooled refinery naphthas
- ★ **20,000 BPD UNIT** for second Gulf Coast refiner to upgrade mixed virgin naphthas

For additional information, write for "FLUID HYDROFORMING", which gives detailed data on the performance, yields and octane ceilings of the process.

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(SUBSIDIARY OF PULLMAN INCORPORATED)

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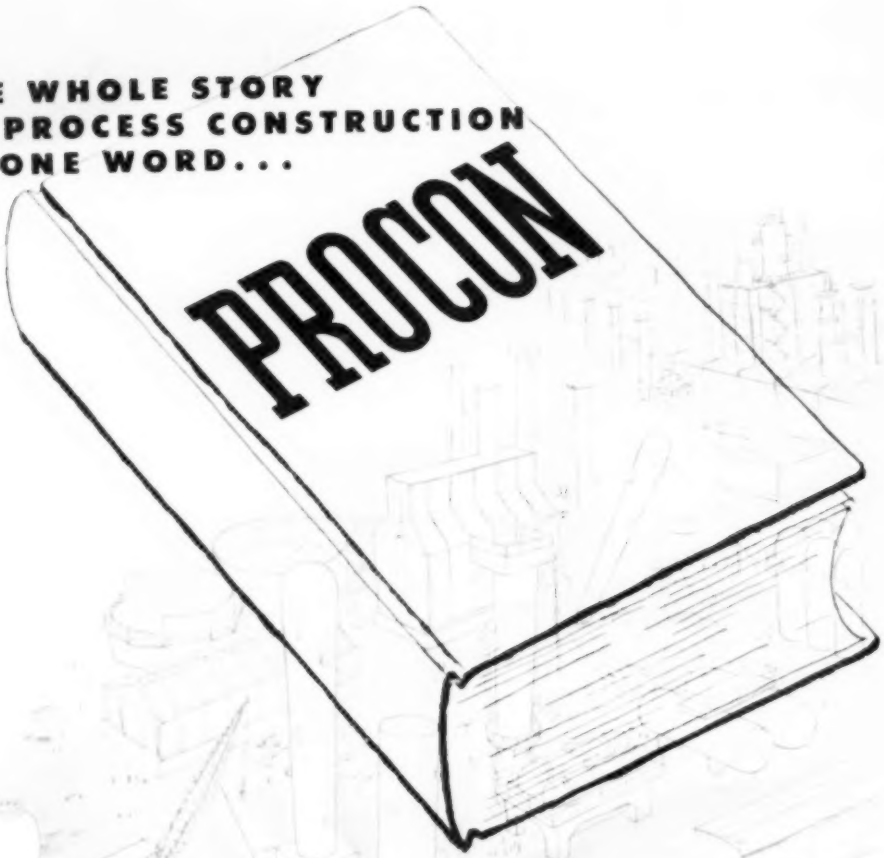
THE WHOLE STORY OF PROCESS CONSTRUCTION IN ONE WORD...



The name *PROCON* tells you that not only does this organization offer a broad range of experience but also provides the necessary flexibility for a practical and efficient construction service on all types of processing facilities. In one word—*PROCON*—is an accurate definition of complete process construction service.

PROCON *Incorporated*

PROCESS CONSTRUCTION

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WHAT'S HAPPENING

Current News Summarized For Oil Men

Expansion

Sunray Oil Corp.'s new refinery at Corpus Christi (See What's Happening, Oct. '51, p. 1051) will be 28,000 b/d instead of originally planned 25,000 b/d. Lummus Co. has been awarded construction contract, with preliminary work to start immediately and completion scheduled for late summer '53.

Imperial Oil Ltd. will spend $7-million to modernize and increase capacity by 2500 b/d at its Regina, Sask., plant. New units include 8100 b/d vacuum pipe still, 7500 b/d Fluid catalytic cracking unit, light ends recovery and treating facilities, new steam generating equipment, and additional storage tanks. Contract will be placed next spring calling for completion of construction early in '54.

Esso Standard Oil Co. plans to spend about $16-million more at its Baton Rouge plant than previously announced (What's Happening, Nov. 1951, p. 1187) and increase capacity from projected 270,000 b/d to 300,000 b/d. Additional construction will include new distillation facilities, expanded Fluid catalytic cracking capacity, and increases in chemical treating, blending, shipping and auxiliary facilities.

McBride Refining Co. reports its 800 b/d Atlantic catalytic reforming unit, started in mid-December, is approximately 65% complete with construction expected to be finished July 1. Also underway is modernization and repair of existing facilities in the 3500 b/d plant at Edinburgh, Texas. Modernization and repair work at Port Fuel Co. plant at Brownsville, a subsidiary, has just been completed.

Lion Oil Co. is commencing a $5-million expansion program for its El Dorado, Ark. refinery to boost throughput from present 22,000 b/d to 23,500 b/d and modernize process facilities. New units scheduled include 5000 b/d Fluid catalytic cracker (fresh charge, with like quantity recycle charge), 1150 b/d alkylation unit, and more boilers, 16,000 gpm cooling tower, tankage and other auxiliaries. Contracts have not been let.

Petrochemicals

American Cyanamid plans a $47,745,000 plant at Avondale, La., (on Mississippi River above New Orleans) to make ammonia chemicals from natural gas. American Cy's only previous petrochemical venture has been as 50-50 owner with the Texas Co. of Jefferson Chemical Co. at Pt. Neches, Texas, making ethylene derivatives.

Solvay Division, Allied Chemical & Dye Co., is planning a new plant at Orange, Texas, to make ethylene oxide from natural gas via the oxidation route from ethylene. Solvay also is erecting a plant at Buffalo, N. Y., reportedly to use its new process for extracting benzene from petroleum, on which no details have been revealed. Division also is planning to switch from coke to natural gas in ammonia manufacture at its Hopewell, Ga., and South Point, O., plants.

Socony-Vacuum Oil Co. has commenced manufacture of commercial quantities of benzonitrile at its Paulsboro, N. J., plant, using a catalytic (silica base) reaction between toluene and ammonia at high temperature and pressure. Pilot operations have been conducted for the past three years.

Mathieson Chemical Corp. has started production of ethylene oxide at its Doe Run (Brandenburg), Ky. plant, and expects to reach capacity shortly. Ethylene glycol also will be produced there. Production of LP-Gases commenced last November. Plant was originally a joint venture of Mathieson and shareholders of Tennessee Gas Transmission Co., under name Mathieson Hydrocarbon Chemical Corp. (What's Happening, May '50, p. 448; July '50, p. 690; Aug. '50, p. 785). Full ownership was acquired by Mathieson Chemical Nov. 28, 1951.

Diamond Alkali Co. is planning to build a vinyl chloride and perchloroethylene plant adjacent to its existing Deer Park (Houston), Texas works (making soda ash, chlorine, etc.) as its first commercial venture into the petrochemical field. Petroleum feed stocks, such as ethylene, and products from the inorganic chemical plant, will be used; the two plant operations will be closely coordinated. Diamond has been conducting a semi-commercial perchloroethylene operation at Deer Park for the past three years.

Pittsburgh Coke & Chemical Co. may be the next large entrant in petrochemicals. Reports are that the firm plans a $20-million venture near Calvert City, Ky., to make acrylonitrile and ethylene glycol. Raw materials would be hydrocarbons stripped from natural gas traveling through adjacent pipeline of Texas Gas Transmission Co.

General Petroleum Corp. has been granted a DPA certificate of necessity on a $4,220,000 "sulfur and process plant" at Worland, Wyo. Sources will be oil and gas from two fields—Manderson and Slick Creek, with plant probably being built near Manderson field. Expected sulfur recovery is 50 tons/day. Construction contracts will not be let until next fall.

Texas Eastman Co.'s new petrochemical plant at Longview, Texas, has commenced partial operation. Production includes n-butyraldehyde and isobutyraldehyde, with the ethanol plant not scheduled for operation before April. Some of the isobutyraldehyde

Information on these pages is obtained through the nation-wide news coverage service of PLATT'S OILGRAM NEWS

will be converted to the alcohol and the acetate. Natural gas and propane are the raw materials.

Carbide & Carbon Chemicals Co. plants at Institute and Charleston, W. Va., have installed new processing units which produce petroleum derivatives for use at its projected $30 million Dynel acrylic fiber plant at Spray, N. C.

Markets, Prices

Pattern of February oil markets was pretty much the same as in first month of '52—weak in the interior refining districts where there was a glut of both light and heavy fuel oils, strong at coastal refining points where trade sources declared the demand for virtually all items, except gasoline, was practically insatiable.

Threatened refinery strikes late in the month stimulated demand (but not prices) in the Mid-Continent and Midwest, tightened still further the already tight coastal markets.

Price moves in principal products were all on the downside, and quotations for a number of specialties also were lower. Highlights follow:

Heavy fuel off 5c to $1.50-.50 bbl., and distillates down 0.125c (No. 2 fuel to 8.125c/gal.) in most Mid-Continent districts. These prices were subject to sharp "discounts" at month's end.

Natural gasoline off 0.5c gal., with Grade 26-70 quoted at 6.375c, Group 3, and 5.875c, Breckenridge.

Mid-Continent lube oils off 1 to 2c/gal., except solvent bright stock, which held at low of 32c. Conventional bright was quoted at 28.5c.

Pennsylvania scale wax 0.25c/lb. lower at 4.25c, and both scale and refined grades were easy in seaboard districts.

LP-Gas—wild as ever. February saw propane quotations of some sellers with "high" ceiling drop from 10c/gal., Group 3, to the 4c ceiling which the principal manufacturers were stuck with in the OPS base period (Dec. '50-Jan. '51).

Industrial Mobilization

A 7% increase in TEL supplies has been granted refiners for the 12-month period beginning March 1. In computing the increase the base amount will be a refiner's 1951 allocation plus all hardship grants made during the March 1, '51-Feb. 29, '52 period. Excluded will be special grants made by PAD for extraordinary demands not expected to recur. Details are spelled out in PAD Order No. 1, as amended March 1, '52.

Procedure for issuing fast tax writeoffs has had two significant changes, effective March 1:

1—No certificate of necessity will be granted for any facility on which construction was begun after March 1, '52 unless an application for such a certificate has been previously filed.

2—No certificate will be granted for any facility costing $100,000 or more (exclusive of land costs) on which construction was begun after March 1, '52, unless DPA has given approval of the application through issuance of either a certificate or a letter of intent.

Small refiners are getting a better break on fast tax writeoffs. Based on certificates of necessity covering about one million b/d additional refining capacity, PAD reports that:

Small refiners (less than 20,000 b/d) are upping crude capacity 20% (from 9.8% of U.S. total to 10.8%), and catalytic cracking capacity nearly fourfold (from 1.8% of U.S. total to about 5.8%).

Intermediate-size refiners (20,000 to 50,000 b/d) are upping crude capacity 24%, catalytic cracking capacity 53%.

Large refiners (50,000 b/d and over) are upping crude capacity 15%, and cracking capacity 41%.

Copper supplies will continue tight, according to NPA, although petroleum industry's 2nd quarter allotment has been upped 500,000 lbs. to 8,275,000 lbs. Measures are under way to expand domestic production, but these projects are not expected to materially relieve current shortage until late '53.

Hydrofluoric acid users can expect increased supplies in the future. DPA has set a capacity goal of 130 million lbs/yr. by 1955, an increase of 36 million lbs. over Jan. 1, '51 capacity. Nearly 75% of this is now under construction or in planning stage.

APPOINTMENTS—V. W. Ischie (operating supt., Sinclair's East Chicago refinery), as deputy director of PAD's Foreign Refining Division, replacing **G. T. Ballou** . . . **John H. Lacy** (Auburn, Ala.), as director of PAD's Manpower Division, replacing **S. E. Hill**.

Miscellany

Military has adopted ASTM standards for testing petroleum products, which means that industry no longer need be concerned with problem of identifying former government test designations with corresponding ASTM standards on fuels and lubricants.

Shell Pipe Line Corp. has let contracts for the $35-million, 455-mile, 24-in. Rancho Pipe Line System to Anderson Bros. Corp. and Houston Contracting Co., both of Houston. Project is joint venture with Sinclair Pipe Line Co., Pan American Pipe Line Co., Phillips Pipe Line Co., Nantucket Pipe Line Co. (Eastern States subsidiary), Crown Central Petroleum Corp. and Ashland Pipe Line Co., with Shell as designer-operator. Initial capacity will be 210,000 b/d of crude, with possible increase to 345,000 b/d. Line will parallel Shell's existing 24-in. line from McCamey, Tex., to near Sealy, thence to Houston by a new route avoiding cities where possible. Oil will be accepted at McCamey and Eldorado. At Genoa connection will be made to a line terminating at Texas City, and between Harrisburg and Deer Park, near Houston, the Rancho will connect with refineries or terminals of Eastern States, Sinclair, Phillips, Crown Central and Shell Oil. Chicago Bridge & Iron Co. has contract for 1,200,000 bbls. of storage at McCamey. Work will start on the line at both ends April 1 and May 1, with completion scheduled for Dec. 1, 1952.

To dust they shall return...

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WEATHER . . . WATER . . . ACID . . . ALKALI All these forces shorten the life of metal equipment. INSUL-MASTIC homogenized coatings, however, will stop them from reaching the metal.

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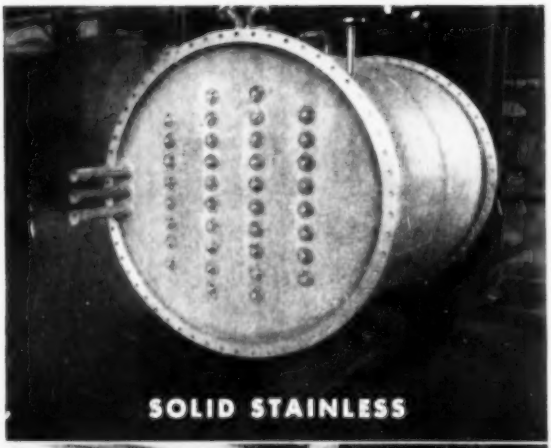

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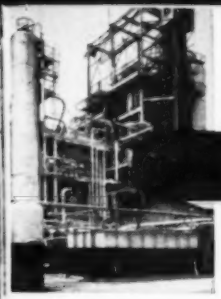
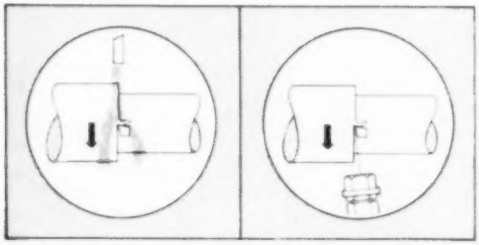


TOMORROW... IN PETROLEUM TECHNOLOGY

Possible Effects of Today's Developments On Future Operations

By the Editors of Petroleum Processing

New Way of Applying Cutting Oils May Obsolete Your Formulations



OLD "flooding" method vs. **NEW** "jet" method for applying cutting oils

CUTTING oils are one of those specialty petroleum products that seldom get much attention. But a new development in the field by Gulf Research and Development Corp. is arousing considerable interest among both suppliers and consumers.

Details on the work were revealed in a paper presented by R. J. S. Pigott, director of Gulf's Engineering Division, at the recent meeting of the Society of Automotive Engineers in Detroit.[1] It involves a radically new method of applying cutting oils to the work.

Cutting oils are supposed to do two jobs—cool and lubricate. Usual practice is to apply them in a heavy stream directed down on the work, letting the oil "flood" the tool and material being cut.

Pigott (who developed the new method) reasoned that this "flooding" action did a good cooling job on the chip of metal as it was cut off the work—but that the more important tool cutting edge was cooled only indirectly by conduction through the chip and tool shank. As to lubrication, since the oil had little or no chance of reaching the tool edge it was more than likely that it wasn't doing that job either.

The solution is so simple that it makes even editors kick themselves for not having thought of it. To get direct application of the cutting oil to the tool and its cutting edge, Pigott conceived the use of a small, high-speed jet, directed up from below and into the space between the side relief angle of the tool and the moving work. The accompanying sketch compares the two methods.

The results of this arrangement are so greatly better than the old method as to be almost fantastic. For normal cutting speeds, the gain in tool life is generally in the order of 7 to 8 times over that experienced with overhead application of cutting oil. At higher than normal speeds, or on tough materials, the difference may be much greater—20 to even 30 times; or speed may be doubled for at least the same tool life.

Gulf calls its new development "Hi-Jet," and equipment for its application is being made by Thompson Products in Cleveland, Ohio, under license.

More important to refiners who make a line of cutting oils, however, is the effect that this development may very well have on the formulation of those oils.

In a recent article, Pigott states that ". . . it was quickly discovered that conventional cutting oils are not the best fluids for the new jet system. Soluble oils, for example, either are not suitable lubricants, or are difficult to pump at the high pressures involved, and lack certain other desirable properties. . . . It appears that with this high-speed jet, the relative ratings of different cutting oils, including solubles, may be considerably changed."[2] —W.F.B.

(1) "Hi-Jet System for Increasing Tool Life," by R. J. S. Pigott, presented at annual meeting, Society of Automotive Engineers, Jan. 15, 1952, Detroit.
(2) "Little High-Pressure Jets from Below Cool Cutting Edges Better," by R. J. S. Pigott, *Amer. Machinist*, Jan. 21, 1952, p. 281.

Looking for a Precise Process? Try Electro Organic Chemistry

THE classical unit processes of industrial organic chemistry may soon be joined by a new technique (but one which is actually quite old to the inorganic chemist), electro-chemistry.

Indications are that electricity can be employed in effecting organic chemical reactions by the basic route of electrolysis in the case of liquids. Some recent developments include:[1, 2]

1. Reacting methane and air to give formaldehyde.
2. Benzene and carbon dioxide to give benzoic acid, diphenyl, and carbon black.
3. Benzene to give diphenyl, carbon black, and acetylene.
4. Decomposing pyridine to aliphatic amines.
5. Hydrogenating pyridine to piperidine.

An unique advantage cited for the process is demonstarted by a procedure based on the supply of electrical energy in short pulses (durations in the order of microseconds). Thus a desired reaction is completed without giving the undesired reactions a chance to complete themselves. An electrolytic cell developed by Minnesota Mining & Mfg. Co. is claimed to be useful for hydrogenation, dehydrogenation, cracking, and polymerization of organic compounds.

The basic form of the electrolysis is the same as any previous electrolytic process, oxidation at the anode and reduction at the cathode. A porous diaphragm may separate the electrodes to prevent mixture of the two products. In electro-organic cells, collection of products at the electrodes causes polarization, giving rise to a requirement for higher voltages to move the products away and keep the process going. The material to be oxidized or reduced usually acts as a depolarizer. Thus, the organic material absorbs the oxygen at the anode or the hydrogen at the cathode. The extent of this oxidation or reduction de-

pends on such variables as temperature, degree of agitation, presence of catalysts, concentration of reactants, nature of reactants, nature of solvent used.

Various objections which have been raised to the use of electro-organic techniques can be overcome. For example, the relative slowness of the reaction may be licked by use of a continuous cell.[3] Another factor has been the cost of the necessary power, but it is believed this can be handled by location in low-cost power areas; i.e., atomic power plants.

On the credit side, electro-organic methods can direct oxidation or reduction to the specific portion of the molecule where the effect is desired. Problem has been that the process is a neglected segment of the fast-growing field of organic industrial chemistry. Only one book on the subject has been published in this country, and that was 25 years ago. By way of comparison, the present giant of the petroleum processing field—catalysis—has had voluminous literature and work. —W.C.U.

(1) "Put Electro Organic Chemistry to Work," by Marshall Sittig, *Chemical Engineering*, January, 1952, pp. 150-1.
(2) U. S. 2,517,301, an electrolytic process and apparatus, assigned to California Research Corp.
(3) U. S. 2,519,063, electrochemical process for making fluorine-containing carbon compounds, assigned to Minnesota Mining & Mfg. Co.

Phthalic Anhydride from O-Xylene Increases Field for Oil's Aromatics

NEARLY a year ago in these columns the statement was made that chemical research would keep pace with any increased production of aromatics other than benzene in consequence of the scarcity of benzene which refiners were asked to help alleviate (May 1951, p. 459). It looks now as though this was a safe prediction and that, in bringing it to pass, the chemical companies will use something else they have learned from the oil refiners: fluid bed catalytic techniques.

The growing call for synthetic resins employing phthalic anhydride is causing several chemical companies to look at other ways of producing this material, both in terms of process techniques as well as starting materials.[1] The conventional route, of course, is catalytic, vapor-phase oxidation of naphthalene, the latter coming principally from coal. At least one company reportedly has designed its process to use either naphthalene or o-xylene.

Ortho-xylene is one of the three xylenes which are produced, along with benzene, in catalytic reforming. The same solvent extraction techniques which recover benzene from the reformate remove the xylenes and others of the higher aromatics which might happen to be present.

At present there is no reported fluid process in commercial use for producing phthalic anhydride from o-xylene, but several chemical firms are exploring ways and means because there is not enough naphthalene to go 'round. Thought of the chemical firms is that, with more petroleum benzene coming on the market and bringing with it large quantities of mixed xylenes, separation of the xylene isomers will be economically attractive enough to provide sufficient o-xylene to warrant their going ahead.

Particular advantage of the fluid process is that it apparently will smooth out some process "bumps" inherent in the older fixed bed method. Among these is temperature, control of which is critical in this exothermic process. Another fluid advantage is that less excess air is required, due to a lower reaction temperature and longer contact time. —D.P.T.

(1) "Three Ways to Phthalic," *Chemical Week*, Feb. 23, 1952, p. 40.

Stretching Our Highway Dollars With Rubber-Asphalt Surfacing

POSSIBILITY of increasing the wear of road surfaces and of greatly reducing their maintenance costs through the use of rubber mixed with asphalt is seen in the second report on the subject issued by the Natural Rubber Bureau, of Washington.[1] With the cost of road building and repair in this country amounting to billions of dollars annually, this development, if successful, could mean a great deal to taxpayers.

Test roads using natural rubber powder were first laid in this country in 1949 in Virginia, Ohio, Texas and Minnesota. More test roads were laid in 1950 in New York, Maryland, Connecticut, Massachusetts and Georgia. Test roads have also been built in this same period in Canada. The oldest test strip of natural rubber road in the U. S. has only been laid since May, 1949. None of the states making tests have as yet felt sufficient time has elapsed to warrant drawing broad conclusions.

"However, each new test and each new month has added to the available facts and to the interest of the highway engineer", states Warren S. Lockwood, Director of the Bureau. "There is every promise that the highway dollar can be stretched in the future by the means of natural rubber surfacing."

Early experiments with rubber-asphalt paving were carried on for many years before the work was taken up in this country, particularly by paving engineers of Java and the Netherlands. One stretch has been in place for several years on a heavily traveled road between Amsterdam and the Hague. It was used by the German Army in invading the Netherlands and by the American Army in pushing the Germans back. Despite the heavy traffic this road is said to be in good condition today.

There are two ways in which the rubber is added to asphaltic paving materials. One method is to mix the rubber directly with the asphalt prior to mixing the asphalt with the aggregate. The second method, used by the Rubber Bureau in most of its experiments, is to add the rubber to the aggregate just after the aggregate enters the mixing chamber of the asphalt plant and prior to the introduction of the asphalt to the mix. No difficulties have been reported in mixing, laying or rolling the rubber-asphalt paving materials.

The Bureau has not confined its experiments to natural rubber. It reports that synthetic, reclaimed and latex mixed with asphalt emulsion have also been used. Natural rubber powder, however, seems to have advantages in this work not found in other forms, it is indicated.

The Natural Rubber Bureau's new research and testing laboratory, at Rosslyn, Va., is now available for more intensive studies of rubber in asphalt for road surfacing purposes.

—V.B.G.

(1) "Stretching Highway Dollars with Rubber Roads," Harry K. Foster, Rubber Road Consultant, Natural Rubber Bureau, Washington.

How to put HD into premium lubricants

Short-trip, stop-and-go driving, the kind of driving most passenger cars get, results in (1) dirty engines and (2) high engine wear. These, in turn, result in several poor-performance factors easily recognized by motorists — high oil consumption, hydraulic valve lifter sticking, general shortening of engine life.

Monsanto Santolube 382 and Santolube 388 will help give your oils the performance demanded by today's passenger cars. These heavy-duty, detergent-inhibitor type additives help keep engines clean, help reduce engine wear.

For technical information on these efficient Santolubes, write MONSANTO CHEMICAL COMPANY, Organic Chemicals Division, 1700 South Second Street, St. Louis 4, Missouri.

Santolube Reg. U. S. Pat. Off.

SANTOLUBE

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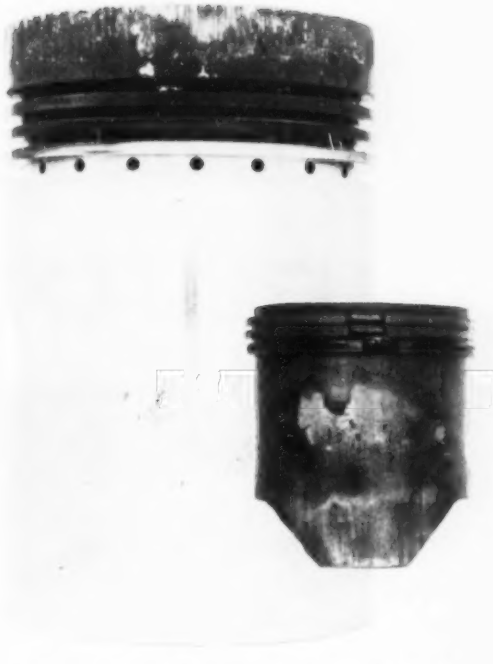
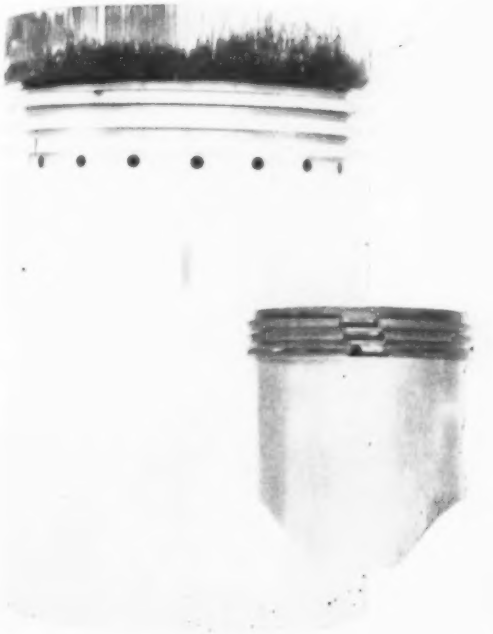
CHEMICALS – PLASTICS

SERVING INDUSTRY . . . WHICH SERVES MANKIND



Upper photo shows diesel and passenger car pistons after engine tests with a good grade of motor lubricating oils. Bottom picture shows results of tests on the same oils, plus Monsanto detergent-inhibitor additives.



(To obtain more data on advertised products see page 384)

It's a cinch to ream pipe with this RIDGID

● RIDGID LonGrip reamers have that extra long-taper that cleans the burr smoothly out of pipe or conduit almost without effort. Just a few light ratcheted strokes do the job. Furnished complete with ratchet handle. No. 2 Reamer unit sold separately for use in RIDGID 00R small ratchet die handle. Two sizes, No. 2, ⅛" to 2" pipe; No. 3, ⅛" to 3" pipe. These RIDGID new type pipe reamers really do save your time, work—and pipe. Ask for them at your Supply House.

Buy reamer complete or reamer unit separately for use with 00R die handle.

RIDGID

★ Work-Saver Pipe Tools ★

THE RIDGE TOOL CO. • ELYRIA, OHIO

LETTERS

The Sinclair Plan

The article by R. F. Adams on "Want to Encourage Inventors?" [Feb. '52 PETROLEUM PROCESSING, p. 175] is of a debatable nature.

A large manufacturing company usually has a sufficient number of employes with vision who are anxious to contribute ideas to the concern for which they are working. Strong research organizations connected with an industry also are capable of keeping themselves occupied within the scope of their activities without asking for outside help. Such help may easily discourage imaginative persons working for an organization and thus undermine the morale.

Independent research organizations trying to promote outside inventions are in existence, but they are not directly connected with large industrial concerns. Therefore, the above conflicts are not apt to arise. However, such organizations may experience difficulties when working on problems requiring expert knowledge of a particular industry.

Future will show whether Mr. Adams' plan will be successful in attaining the desired goal.

VLADIMIR A. KALICHEVSKY
Beaumont, Texas

Tank Farm Blaze

Could you or Mr. Breese furnish your readers with any additional information ["Five Fire Protection Lessons Learned by Tank Farm Blaze," Oct. '51 PETROLEUM PROCESSING, p. 1112] as to:

1—Method of grounding used on Tank No. 100.

2—Current thought on the effectiveness of grounding light-product tanks; i.e., are static discharges of this type caused by the failure of normal grounding connections to dissipate such a rapid build-up in potential?

GEORGE A. SPEIR
Gulf Oil Corp.
Philadelphia, Pa.

Frank Breese, our West Coast Editor, who wrote the original article, put Mr. Speir's questions to Union Oil Co.'s Training and Safety Supervisor Jim Hill, with the following results:

● 1—Tank 100 was inherently grounded, particularly through connecting pipe lines and complex manifolding. No special grounds were provided. There are no API, NFPA or generally recognized industry standards that call for special grounding of conventional storage tanks. Neither theoretical considerations nor case history points to its need.

In numerous discussions in the API Static and Stray Current Committee it has been pointed out that special grounds as mentioned serve no use-

(To obtain more data on advertised products see page 384)

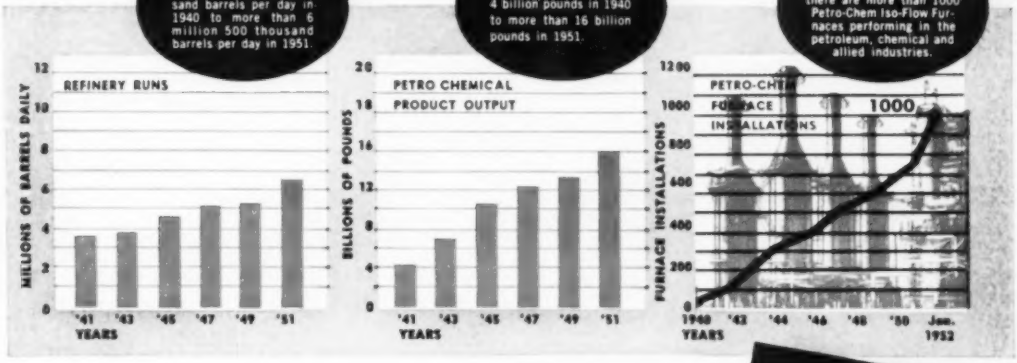
CONFIDENCE *spells growth*

There's many a reason for the parallel growth of the Petro Chemical Industry and the increasing use of Petro-Chem Iso-Flow Furnaces by leading Petro Chemical Companies.

Runs to stills in U. S. oil refineries increased from 3 million 500 thousand barrels per day in 1940 to more than 6 million 500 thousand barrels per day in 1951.

Petro Chemical production has increased from 4 billion pounds in 1940 to more than 16 billion pounds in 1951.

In 1940 there was 1 In 1946 there were 400 and as of Feb 1952 there are more than 1000 Petro-Chem Iso-Flow Furnaces performing in the petroleum, chemical and allied industries.



ISO-FLOW FURNACE USERS KNOW . . . that the Petro-Chem Development Company has but one basic product; processing furnaces for petroleum, chemical and allied industries. As a result of experience, they know that it does not pay to build their own furnaces; that Petro-Chem Iso-Flow Furnaces cost less, operate efficiently and usually beyond their rated capacity . . . *they know that all process data made available for the design and engineering of Petro-Chem Iso-Flow Furnaces is kept strictly confidential . . . never released by Petro-Chem Development Company engineers.*

The Petro Chemical, Petroleum, Chemical and allied industries can be confident that as they grow in size and advance in technology, so Petro-Chem Iso-Flow Furnaces will keep pace.

There's a **PETRO-CHEM ISO-FLOW FURNACE** *for every process requirement of the petroleum and chemical industries*

for any **DUTY TEMPERATURE PRESSURE EFFICIENCY**

PETRO-CHEM ISO-FLOW FURNACES

UNLIMITED IN SIZE . . . CAPACITY . . . DUTY

PETRO-CHEM DEVELOPMENT CO., INCORPORATED

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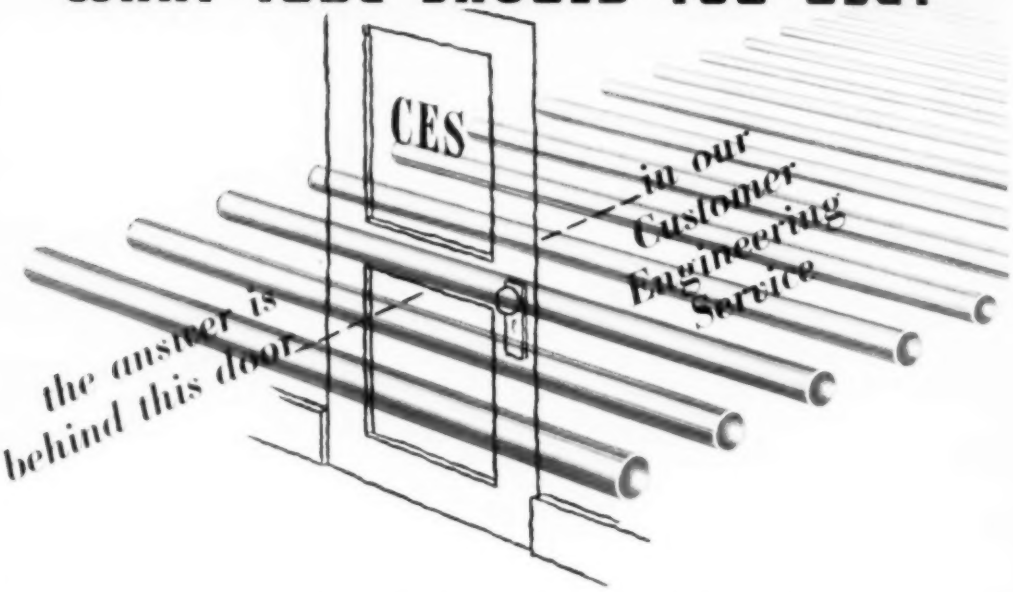
Bethlehem Supply, Tulsa and Houston · Flagg, Brackett & Durgin, Boston · D. D. Foster, Pittsburgh
Faville-Levally, Chicago · Lester Oberholtz, California · Gordon D. Hardin, Louisville, Kentucky

WHAT TUBE SHOULD YOU USE?



A tube of a certain alloy will "take it" better than a tube of a different alloy.

And these days — when you are vitally interested in keeping your condensers operating at full efficiency as long as possible — you must be absolutely certain that the tubes in those condensers are most suitable for the material they must handle.

Be sure that they are made of the alloy that is most immune to the corrosive action of the liquid or gas the tubes will carry and therefore give you the longest uninterrupted service.

Whether it's a question of proper alloys — the best wall thickness of tube to use — or a question of the relative values of plain tube against finned tube — you'll find the answer here at Wolverine's Customer Engineering Service.

We suggest that you draw on the wealth of specialized experience that is here at your command without obligation.

WOLVERINE TUBE DIVISION
Calumet & Hecla Consolidated Copper Company
INCORPORATED
Manufacturers of seamless, nonferrous tubing
1425 CENTRAL AVENUE, DETROIT 9, MICHIGAN

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Sales Offices in Principal Cities

Export Department: 13 E. 40th St., New York 16, N. Y.

ful purpose regardless of the fact that some few companies still employ them.

2—When dry non-conducting oils in conventional storage tanks are agitated by any method such as overshot filling, strong circulation, rolling with gas or air, etc., static charges accumulate on the oil surface. When the accumulation has reached a certain magnitude, the ionized air above the oil surface permits the static electricity to bleed off to ground (tank walls, roof supports, etc.). If the free oil surface exceeds about 15 ft. in diameter, the static accumulation and intensity of bleed-off may create static sparks of sufficient energy content at the tank wall or roof supports to ignite hydrocarbon vapors. Then, if the vapor concentration in the area of the spark is within the flammable range, ignition will occur. As the spark exists at the ionized air band between the accumulated static charge on the oil surface and some metal part of the tank itself, it should be evident that the lack or presence of a special grounding device has no bearing upon the problem, on a conventional storage tank.

At the present time the API Static and Stray Current Committee is preparing a manual on static phenomena as it applies to oil industry operations, and it is hoped that it will clear up many of the prevalent misunderstandings of the subject.

JAMES E. HILL
Training and
Safety Supervisor
Union Oil Co. of Calif.
Los Angeles, Calif.

Russia's Refineries

I read with considerable interest your recent article relative to Russia's capacity to fuel a war [Oct. '51 PETROLEUM PROCESSING, p. 1116]. Although Russia greatly lags the U. S. in production and refining, I agree that she has an enormous potential, which, if properly exploited, could give us considerable trouble and competition.

As I was an American technician in the Soviet Union from 1943 to 1945, . . . I am writing to advise you of three other oil refineries not shown on your map. I spent most of my time there in a village west of Emba, where we helped construct, on barren land, a completely integrated modern refinery installation, including a fixed-bed catalytic cracking unit, an alkylation unit, etc. A second is located considerably south of Emba, with the third being some 400 miles east of Moscow. The other plant designed and built by the organization I was working for is located at Orsk, as you've shown.

N. C. FULLER
Fairview Park, Ohio

Stuck without WARNING

Who's stuck?

Safety valves that weren't safe? The plant which installed them?

None of this was necessary. If you want 100% safety—and you'd hardly want less—there's one sure way to get it—specify BalanSeal or FarriSeal Valves.

Why?

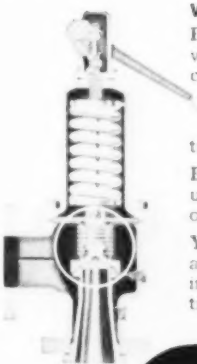
Because they *can't* stick, plug or corrode. Critical working parts are permanently isolated from any contact whatever with the lading.

Because they're unaffected by back pressures in the discharge manifold due to its own operation or to the opening of other valves in the line.

Because these features make it possible for you to use smaller discharge piping, an economy which is often substantially more than valve cost.

You'll be interested in the engineering of BalanSeal and FarriSeal Valves—design which is rapidly gaining acceptance in hundreds of successful installations.

Ask for our "8-Minute Brief."



Your Safety's REAL With FarriSeal

Farris ENGINEERING CORP.

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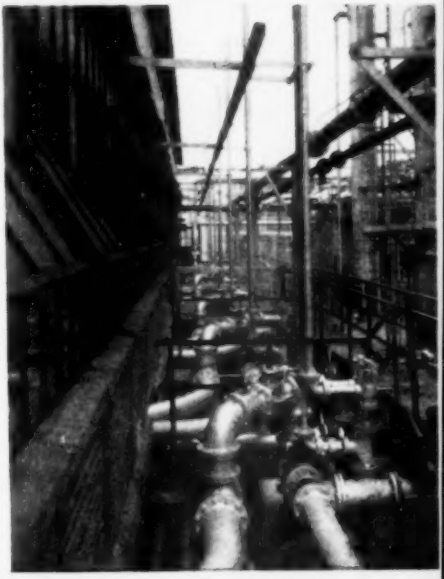
(To obtain more data on advertised products see page 384)

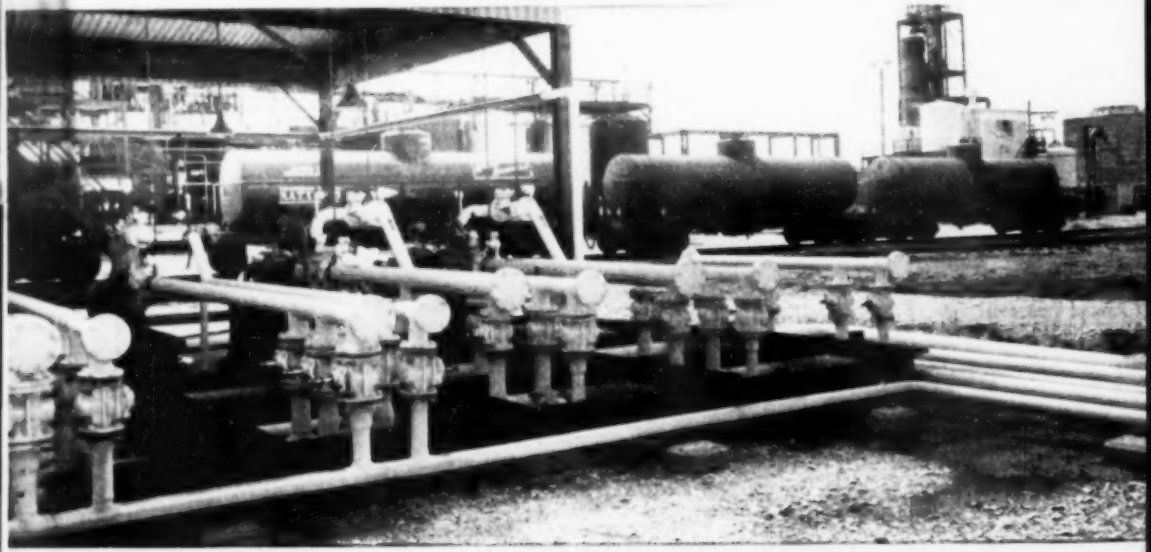
There's a Nordstrom Valve for

Examples: RAW MATERIAL, REFINERY GASES,

HOT OIL—Three-way Nordstrom Multiport valves in hot oil service at Wood River, Ill., refinery.



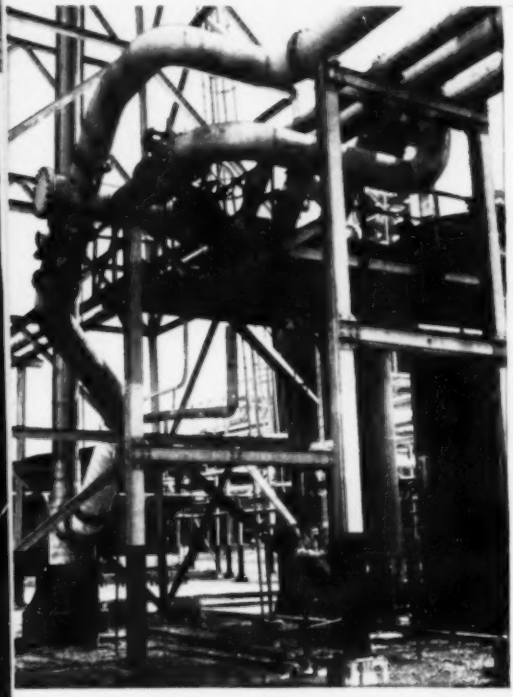
COMPRESSOR LINES—In this giant Louisiana refinery, the compressor lines on gas recovery booster are just one of dozens of different Nordstrom installations.



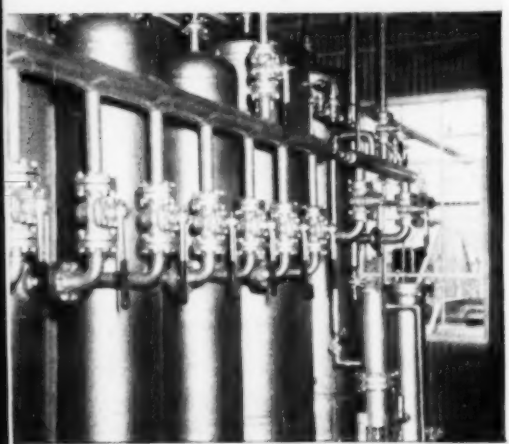
RAW MATERIAL TRANSFER—Manifold in raw material transfer area in this Gulf Coast refinery is completely Nordstrom equipped.

Most Every Refinery Service

HOT OIL, AIR LINES, EQUIPMENT LINES



GAS MANIFOLD—The valves on the manifold to the plant flare, like hundreds of other in this huge New Jersey refinery, are Nordstroms. These particular ones are Fig. 4169.



AIR LINES—Engine air starting tanks in Oklahoma refinery controlled by easy-operating Nordstroms.

No valve is suited to so many refinery services as Nordstrom. Hundreds of thousands of Nordstrom lubricant-sealed valves have been proved in installations wherever petroleum is refined.

For complex, hard-to-hold refinery line fluids there are suitable, cost-saving Nordstrom valves. And because Nordstrom valves fit so many refinery services, storerooms carry smaller valve inventories. Because Nordstroms seldom need repair—because the lubricant-sealed seating ports are never exposed to line fluid—storerooms carry few maintenance parts.

Modern cost-watching refineries have standardized on Nordstrom valves. Let a Nordstrom engineer show you how it pays. Rockwell Manufacturing Company, 400 N. Lexington Avenue, Pittsburgh 8, Pa.

Now You Can Easily Fit Nordstrom Valves To Each Service in Your Refining Process

So that refinery engineers can select the proper Nordstrom valves for each service in the principal refining processes, a series of specification sheets showing recommended materials, pressure classes, lubricants and valve figure numbers has been prepared. There is a special Nordstrom Specification Bulletin for each of these processes:

- Catalytic Polymerization
- Crude Topping and Vacuum Distillation
- Cycloversion
- Delayed Coking
- Distillate Recovery in Cycling Plants
- Duo-Sol Solvent Extraction
- Fluid Catalytic Cracking and Gas Recovery
- Girbotol Process
- Houdriflow Catalytic Cracking and Gas Recovery
- Hydroforming Process
- Light Ends Fractionation
- Naphtha Polyforming
- Phenol Extraction
- Propane Deasphalting
- Propane Dewaxing
- Solexol Process
- Solvent Dewaxing
- Thermal Cracking
- Thermal Reforming

A Nordstrom service engineer will be glad to review these specification sheets with you. Call your nearest Rockwell office or write to Rockwell Manufacturing Company, 400 N. Lexington Ave., Pittsburgh 8, Pa.

Rockwell Another Product **Built**

Nordstrom Valves

Lubricant Sealed to Keep Upkeep Down

. . . FOR VENT LINES ON OIL AND GAS SEPARATORS

Fisher Series 63 Back Pressure Regulators are used where pilot control, stable regulation, and tight shut-off are required.

The main valve assembly is pressure loaded by the pilot valve. The pilot consists of a connected double diaphragm assembly, two springs and a 3-way valve.

If upstream pressure increases above the pilot spring setting, the pressure under the lower diaphragm pushes up on the diaphragm assembly, closing the supply port and opening the exhaust port. This bleeds pressure off of the main diaphragm allowing the unbalance pressure to open the main valve until the pilot is again in equilibrium. If the upstream pressure decreases, the reverse is true, with pressure building up above the main diaphragm tending to close the main valve.

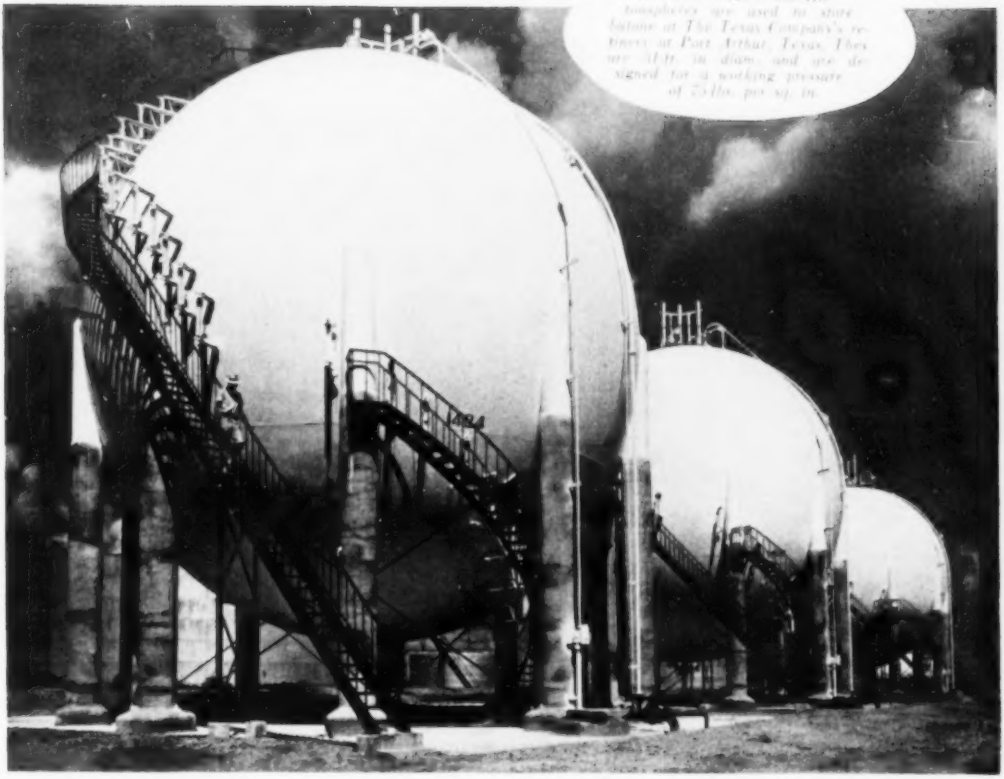
The back pressure range may be set anywhere from 10 lb. to 125 lb. by simply turning the adjusting screw in the pilot spring case.

Features

1. **Absolute tight shut-off.**
2. **Accurate and stable control.**
3. **Full line orifice permits maximum capacity.**
4. **Non-bleed type of pilot.**
5. **Teflon stem seal eliminates lubrication and reduces friction, contamination and attention.**

FISHER GOVERNOR COMPANY • Marshalltown, Iowa

SIX REASONS WHY HORTONSPHERES PROVE SUPERIOR FOR STORING BUTANE



These three 12,000-bbl. Hortonspheres are used to store butane at The Texas Company's refinery at Port Arthur, Texas. They are 48'0" in diam. and are designed for a working pressure of 25 lbs. per sq. in.

1 **Economical Storage**—The spherical shape of the Hortonsphere utilizes material to the best advantage. The result is a lower cost per barrel for storage pressures exceeding 25 lbs. per sq. in.

2 **Positive Protection**—The Hortonsphere prevents the escape of any of the contents as long as the internal pressure does not exceed the setting of the pressure relief valves.

3 **Low Fire Hazard**—A Hortonsphere storing butane does not draw in air through the vents as product is withdrawn. Lack of oxygen in the tank reduces the fire hazard to a minimum.

4 **Low Maintenance Costs**—Painting of a welded steel Hortonsphere is much easier and less costly because all parts of this modern storage tank are above the ground and readily accessible.

5 **Minimum Corrosion**—Since oxygen is rarely present in a Hortonsphere—the inside of the tank shell is free from corrosive action. A longer more profitable life is assured.

6 **Dependable Service**—The Hortonsphere is a plain storage tank with no operating parts except the valves and fittings. Write our nearest office for information. There is no obligation.

CHICAGO BRIDGE & IRON COMPANY

Plants in BIRMINGHAM, CHICAGO, SALT LAKE CITY, and GREENVILLE, PENNSYLVANIA

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Chicago 4 . . . 2114 McCormick Building
Cleveland 15 . . . 2215 Guildhall Building
Detroit 26 . . . 1532 Lafayette Building
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Houston 2 . . . 2130 C&I Life Building
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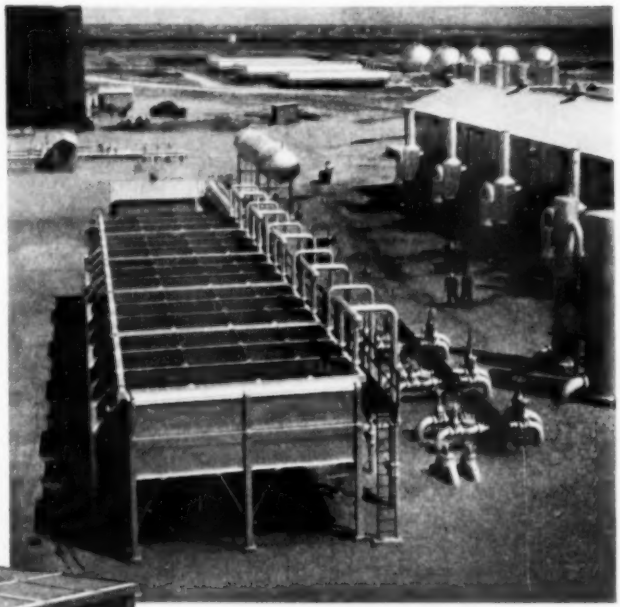
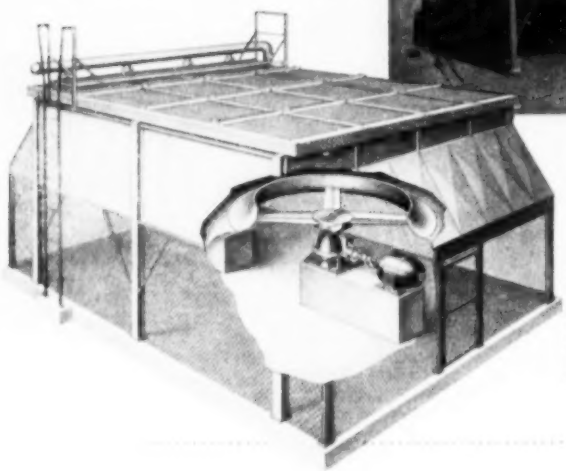
make your own comparison...

a Fluor-GR Fin-Fan

against any other air-cooled heat exchanger

When considering air-cooled heat exchanger equipment, compare the advantages of a Fluor-GR Fin-Fan. Make comparisons of structural simplicity and flexibility. Compare the exclusive features of the Griscom-Russell K-Fin section, the rugged yet precision design of Fluor mechanical equipment. Check *proven performance* in such varied services as gas transmission systems, petroleum refineries, light hydrocarbon processing plants, chemical processing plants, and power and industrial plants. Before you buy or specify, compare the Fluor-GR Fin-Fan. A Fin-Fan provides more exclusive design features —features that add up to *efficient, dependable* performance—than any other make of air-cooled heat exchanger. Write for Fluor Bulletin No. FE-8501.





Compare

structural design

Structurally, the Fin-Fan is the ultimate in simplicity and flexibility. Its "truss type" design provides a rugged, vibrationless unit, free of extraneous parts. Uniform prefabrication of parts, with bolt holes and orientation incorporated in basic design, permits easy extension without shut-down of existing units!

Compare

K-Fin features

G-R K-Fins are tension-wound for moderate temperatures, rolled into grooves for elevated temperatures. Threaded header plugs provide quick, easy access to tube ends for cleaning or replacement. Plugs are shoulder tight to form a leakproof metal-to-metal joint at all pressures, independent of thread tightness.

Compare

mechanical equipment

Fluor mechanical equipment is ruggedly designed to meet specific heat transfer requirements. 4 basic gear units cover 4 different and distinct horsepower ranges. This, coupled with a choice of fan assemblies ranging from 8' to 20' in diameter, with 4 or 6 blades per fan unit, enables the proper combination of gears and fans to effect optimum efficiency.

Compare

proven performance

More Fluor-GR Fin-Fan Air-Cooled Heat Exchangers are in service throughout the continental United States and in countries abroad than any other make. More Fluor-GR Fin-Fan installations are the result of repeat orders than any other type. Check with your nearest Fluor Representative for the Fin-Fan's outstanding record of proven performance—in services and duties similar to your own!

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Engineers - Constructors - Manufacturers

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MAGNETIC COUPLING

A BASIC ADVANCE IN INSTRUMENTATION ... eliminates the stuffing box

Particularly suited for flow measurement or level determinations

The patented, separation-proof MAGNABOND Magnetic Couplings are simple, safe, positive, and precise. They utilize a unique system of permanent magnets to pick up the float position of a primary element eliminating the need for stuffing boxes or packing glands.

After years of highly successful use with FLOWRATOR variable-area flow measurement meters, the MAGNABOND coupling's usefulness is being extended to LEVELIMETER liquid level measurement instruments, V/A Cell Kinetic Manometer flow units, and Mercury Manometer flow meters.

For more information about the MAGNABOND coupling, its applications and possibilities, ask for Catalog 75 describing F&P Levelimeters; Catalog 37 on Mercury Manometer Flow Meters; Catalog 42 on V/A Cell Flow Meter units; Catalog 50, describing MAGNABOND Transmission and Exhibiting and Controlling Instruments for use with FLOWRATOR Meters.

for
MOLTEN SOLIDS
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CORROSIVES
AND OTHER
DIFFICULT FLUIDS

PROCESS
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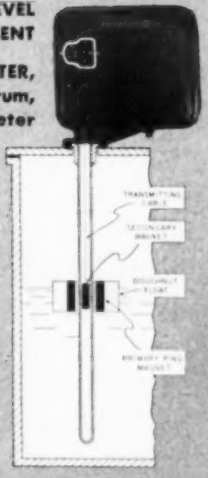
SOME MAGNABOND SYSTEMS

VARIABLE-AREA FLOW MEASUREMENT

FLOWRATOR flow meter

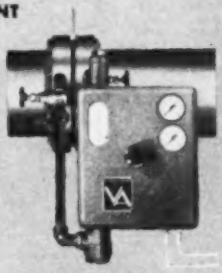
LEVEL MEASUREMENT

LEVELIMETER, Cable & Drum, liquid level meter



DIFFERENTIAL PRESSURE MEASUREMENT

F&P Mercury Manometer flow meter



V/A Cell Kinetic Manometer flow meter

Who's the favorite when the chips are down?

Before and during World War II you saw a large number of alkylation units built to satisfy urgent demands for higher octane gasolines. After the war many of these plants were closed down. Today the need is great again, and these plants are being reactivated. And many new ones are being built.

And practically all of them use the Carrier Centrifugal Compressor for this vital work. Why?

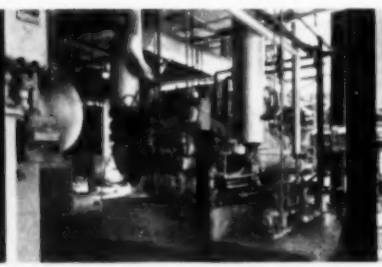
For one thing, the Carrier Centrifugal Compressor maintains exact levels of temperature and pressure, with no need for complex control equipment. For another, it gives you the extra protection of lead-coated wheels should acids ever escape. It's the only compressor that does give you this extra protection.

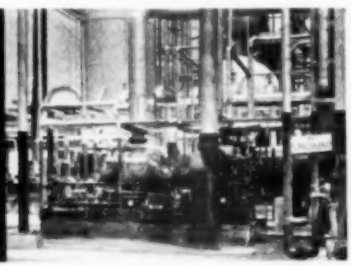
Mainly, though, the reason the Carrier Centrifugal is everybody's favorite is this: when the chips are down, nothing pays off like *experience*. And the people who build the Carrier Centrifugal have built more multi-stage centrifugals than any one else. Experience like that is mighty important to you, in alkylation processes and in other industrial applications, too.

There's more information on the Carrier Centrifugal Compressor in our new catalog, "Centrifugal Compressors for Industry." Write for it. Carrier Corporation, Syracuse, New York.

Carrier

CENTRIFUGAL COMPRESSORS
REFRIGERATING EQUIPMENT





Carrier Centrifugal Compressors are built in stands and designs from 3000 to 40,000 cfm, with three to seven wheels. Shown here are Carrier 600 series Compressors in Sinclair Oil's alkylation unit at Carter Creek, Wyo., and in the alkylation unit in Mid-Continent Petroleum's Tulsa refinery.

They're DROP FORGED

of STEEL...

W-S Screw-End and Socket-Weld Fittings

There are several big benefits to you implied in this simple statement of fact about W-S Fittings.

First, forging means *strength*—the strongest, most compact physical form, steel for steel, obtainable by commercial methods of fabrication.

Second, *being* stronger, forged fittings are much *smaller* and *lighter*, size for size, than other types.

Third, *dimensional accuracy* is characteristic of the forging process—and because forged bodies *are* more accurate, they chuck better, can be machined to *closer*, more *uniform tolerances* than other types.

To these inherent advantages of *forged* fittings, add Watson-Stillman's modern manufacturing facilities, a production control system that's air-tight from furnace to finished product, and a sales engineering staff dedicated to SERVICE in the largest sense of the word. The total is heavily weighted in favor of the advantages of W-S Double-Diamond Forged Steel Fittings.

• Lower Service Cost • More Uniform
• Stronger • Smaller • Lighter • Tighter

SOLD THROUGH LEADING DISTRIBUTORS . . . EVERYWHERE

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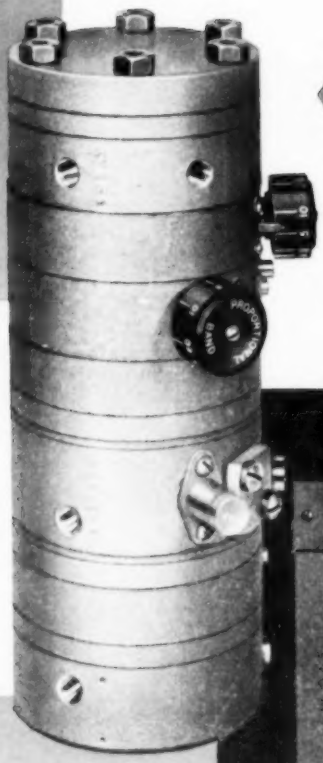
Designers and Manufacturers of Forged Steel Fittings, Wire Rope Shears, Hand Pumps, Jacks, Pipe Benders and Hydraulic Equipment

Important

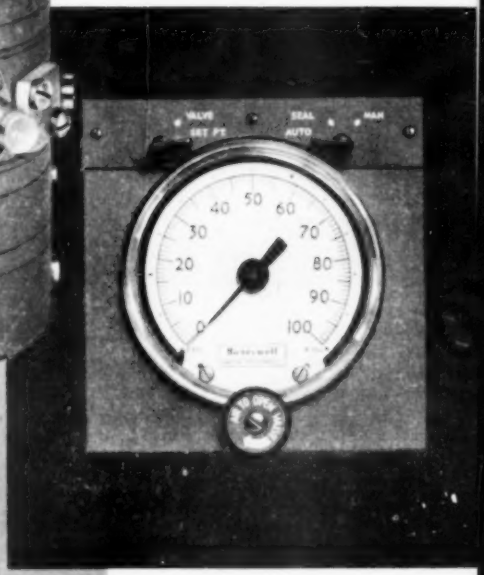


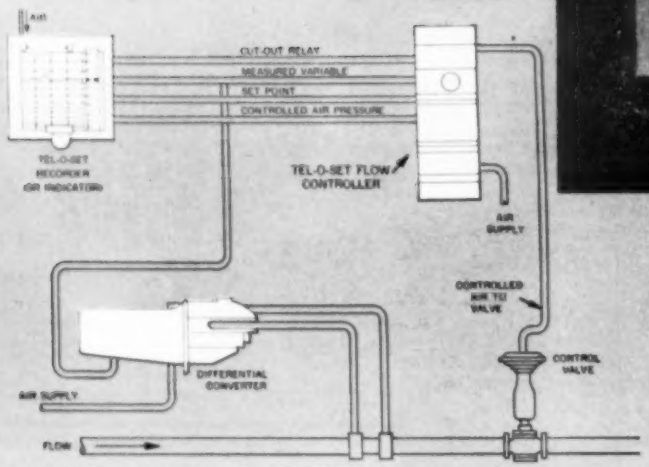
TEL-O-SET CONTROLLER

Available in adjustable and fixed proportional band models, and with three control forms . . . for flow, temperature, pressure, level and other process variables. Universal bracket permits optimum flexibility in mounting . . . coded, interchangeable sections and split manifold contribute to simplified maintenance. Write for Specification Sheet No. 768.

TEL-O-SET RECORDER

Features withdrawal of chassis for full 8-hour chart visibility without interrupting operations, bumpless shifting from automatic to manual operation, all adjustments from front of panel, built in adjustable restrictions for pulsating flow . . . requires panel space just 5 ¼" high by 5" wide. Write for Specification Sheet No. 769.





TYPICAL ENGINEERED *TEL-O-SET* CONTROL SYSTEM — Pictured in this diagram are the elements of the *Tel-O-Set* Family, designed and built as an integrated loop. Here the system is applied to the control of flow with the *Differential Converter* used as transmitter.

TEL-O-SET INDICATOR

Can be used with any pneumatic transmitter, having a 3-15 psi controlled air output, regardless of the primary element being used. Provides indication of process variable, set-point of controller or controlled air pressure to valve when on automatic control . . . is easily shifted to manual operation. Panel cut-out size same as recorder. Write for Specification Sheet No. 770.

Contribution to Process Control

. . . THE HONEYWELL TEL-O-SET FAMILY

THIS pace-setting pneumatic control system is ready for application to a host of processes demanding a new high in speed, precision and accuracy . . . for almost any process variable. Developed as part of a family relationship, each unit complements the others in producing a system of superior performance.

Used with any one of a group of Honeywell measuring elements . . . for flow, temperature, pressure, liquid level, etc. . . . the *Tel-O-Set* system is destined to make important contributions to the improvement of process control throughout industry.

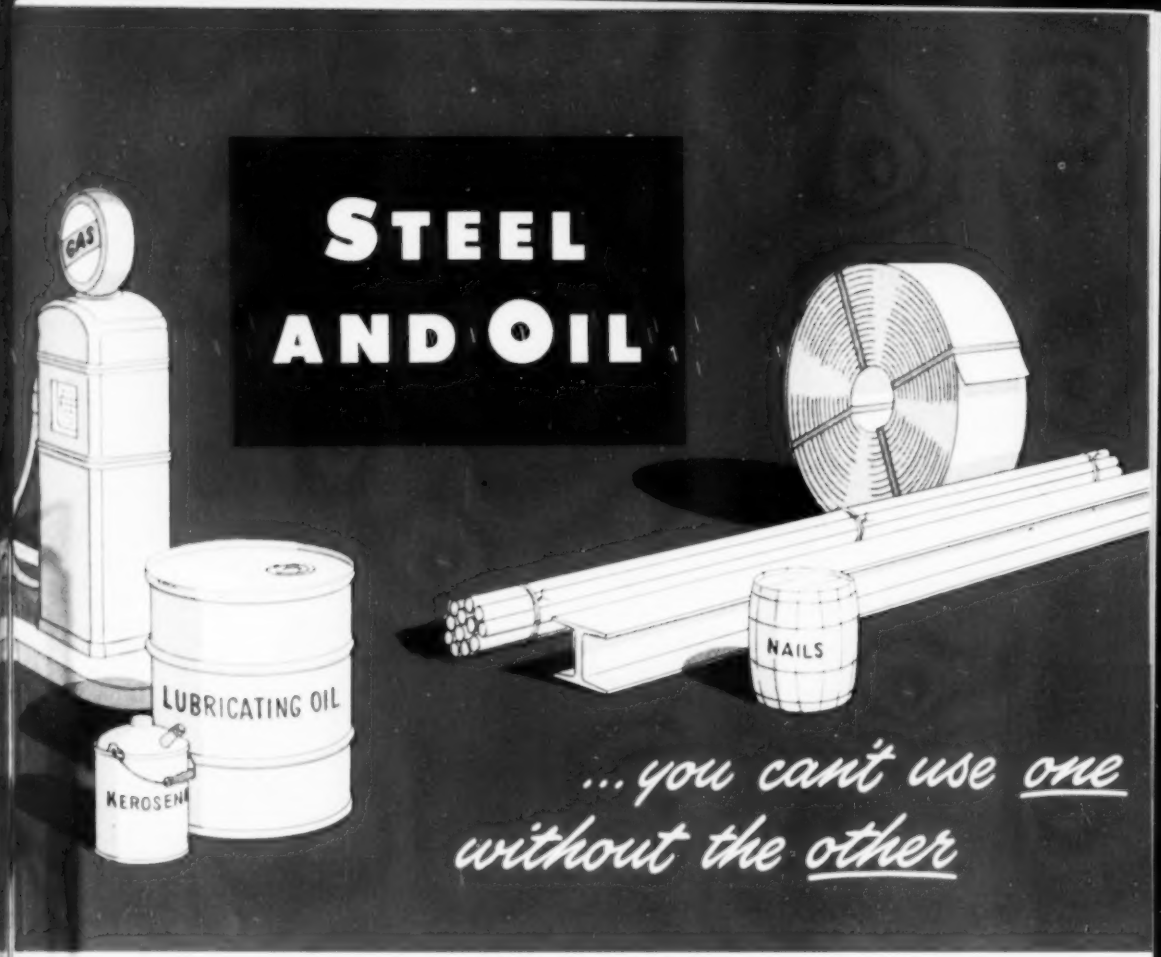
For more detailed information, send for the literature mentioned in the descriptions at left . . . or call in our local engineering representative for a discussion of your process control problems.

MINNEAPOLIS-HONEYWELL REGULATOR CO., *Industrial Division*, 4582 Wayne Ave., Philadelphia 44, Pa.

MINNEAPOLIS
Honeywell
BROWN INSTRUMENTS

First in Controls

H



McKee builds the plants that produce them

It's virtually impossible to find a place where steel is used without the use of some petroleum product in its production, fabrication or operation. It is just as hard to name a use for gasoline or oil without steel in the picture.

Steel and Oil—these are industry's "inseparables" and they are needed today in greater quantities than ever before.

The McKee organization has designed and built hundreds of plants in the United States and some 25 foreign countries and is now engineering new facilities which will account for a definite increase in the production of iron and steel and petroleum products.

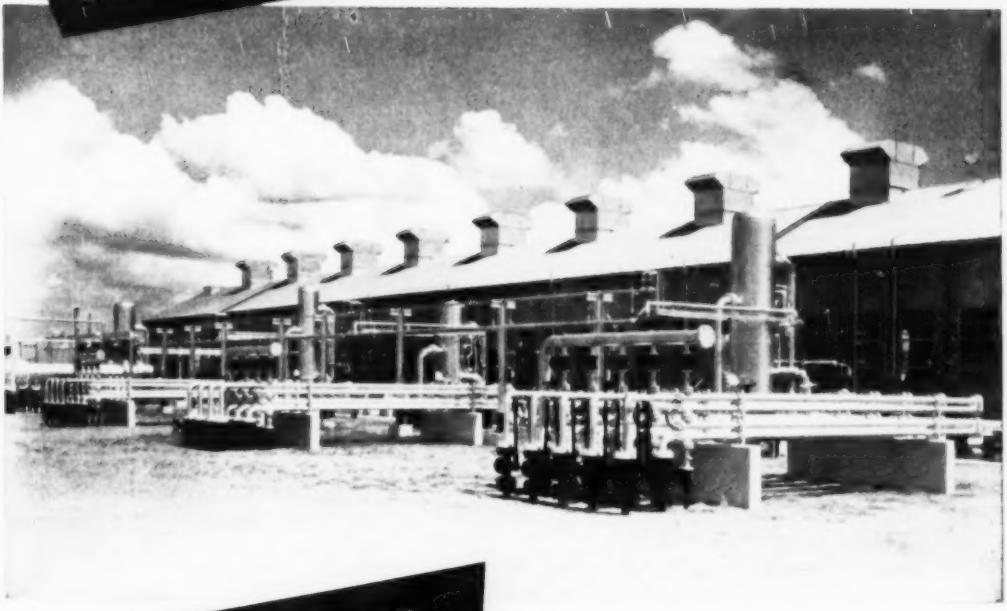
DESIGN, ENGINEERING AND CONSTRUCTION FOR THE PETROLEUM REFINING AND IRON AND STEEL INDUSTRIES

McKee Engineering

Arthur G. McKee & Company • Established 1905

Headquarters: McKee Building, 2400 Chester Avenue, Cleveland 1, Ohio. *New York Office:* 30 Rockefeller Plaza, New York 20, N.Y. • *Washington Office:* 1507 M Street, N.W. Washington, D.C. • *England:* The Iron and Steel Division of Arthur G. McKee & Company is represented by Head, Wrightson & Company, Ltd. *District Engineering Offices:* Union, New Jersey and Tulsa, Oklahoma.

Reduce Obsolescence in your plant



with **BROWN FINTUBE** *sectional hairpin heat exchangers*

● Brown Fintube's interchangeability of parts, exacting design and precision manufacture has "licked" obsolescence.

The sections can be used in one bank after another — on different duties — and different products. A bank can even be broken up and the sections shipped to two or more plants, miles apart, re-assembled and reused. Sections not in use serve as "stores" for other sections on stream. They are never obsoleted by changes in duty or plant re-arrangements. You can use and reuse them until they are completely worn out. Estimates and quotations furnished promptly. ***Write for Bulletin No. 481.***

THE BROWN FINTUBE CO.

Elyria, Ohio

Sectional Hairpin Heat Exchangers
Tank Suction and Line Heaters
Fintube Heaters for Bulk Storage Tanks
Indirect Process Air Heaters
Fintube Heaters for Processing Tanks
Integral Welded Fintubes for Any Heating, Cooling or Heat Transfer Service

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Cat Cracker at Optimum Performance

IF YOUR CATALYTIC CRACKING UNIT IS NOT PERFORMING AS YOU BELIEVE IT SHOULD, FILTROL'S TECHNICAL GROUP IS PREPARED TO ASSIST YOU IN REVIEWING YOUR OPERATION, WITHOUT OBLIGATION, REGARDLESS OF TYPE OF CATALYST USED. RECOMMENDATIONS TOWARD IMPROVED PERFORMANCE WILL BE MADE—WHEN INDICATED—BY COMPARISON OF ACTUAL AND PREDICTED YIELDS.

THIS SERVICE PLACES AT THE DISPOSAL OF THE REFINER THE EXPERIENCE AND OBSERVATIONS GAINED FROM STUDY OF ALL TYPES OF CATALYTIC CRACKING OPERATIONS IN WHICH OVER 1,000,000 BARRELS A DAY ARE CRACKED WITH FILTROL CATALYSTS. EXPANSION OF FILTROL'S TECHNICAL GROUP NOW PERMITS THIS OFFER TO THE ENTIRE REFINING INDUSTRY. WRITE FOR PARTICULARS.

OTHER
REASONS FOR USING
FILTROL CATALYSTS

1. HIGHER OCTANE BARRELS
2. HIGH BUTYLENE YIELD
3. LOW COST
4. SULPHUR RESISTANT CATALYSTS
5. FASTER REGENERATION RATE
6. VARIED PLANT FACILITIES
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Filtrol* CATALYSTS AND ADSORBENTS

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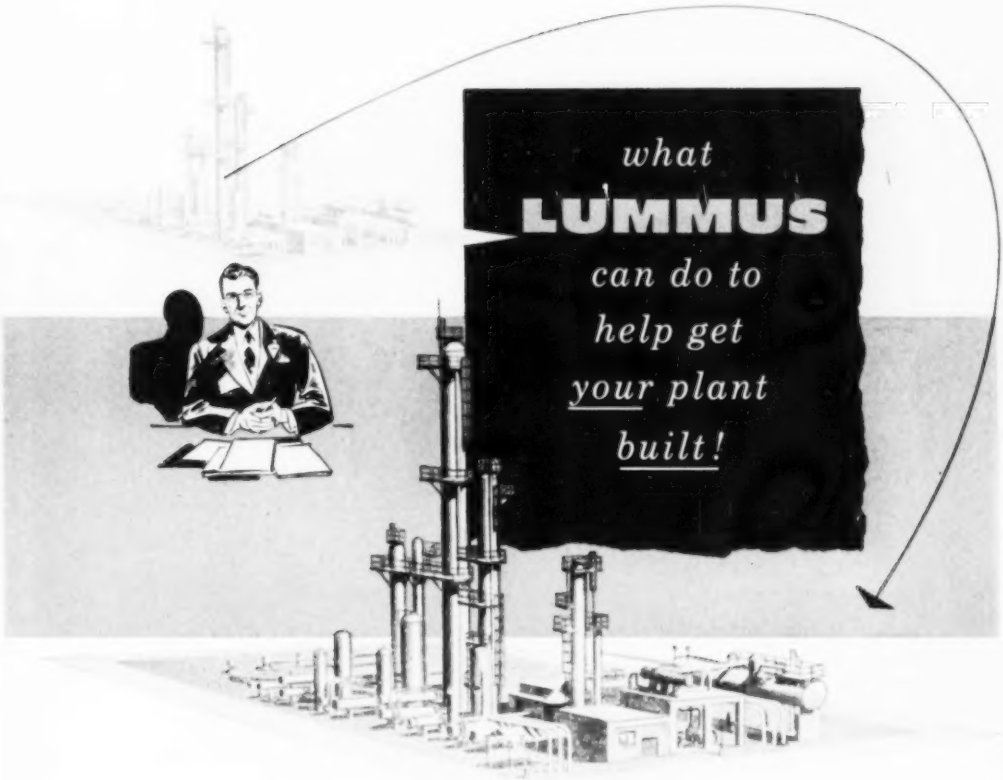

Design, engineer and construct it? Of course. These three main classes of service—performed under *one* contract with *single* responsibility—are our bread and butter. They have produced more than 600 plants of all types in just about every country where petroleum is refined or chemicals are made.

Today's conditions, however, call for departures from "routine." Otherwise, endless complexities, shortages, etc., could require three times the normal effort to get a plant built. But Lummus has the quality and versatility of staff—the breadth and depth of operations, to meet these conditions head-on and help you maintain near-normal status.

It could work like this. In the interest of "first things first," you may need basic studies and reports covering alternative routes for reaching your goal. If so, rely on Lummus to develop analyses on which to base sound capital investment decisions.

Perhaps your problem is not so much with process units themselves, but with tying the whole system together for full operating efficiency. Lummus has long-established experience in laying out and installing complete off-site facilities—the bringing in of utilities—piping to introduce charge materials and carry off products—tankage, dockage, loading facilities, etc. This is "know-how" you can use to advantage.

Among other added factors are the considerable help we afford in procuring materials, and invaluable counsel in interpreting government rules and regulations—all in all, unique services geared to the times.

We invite you to use our various services, either singly or in combination—to get that plant *built!*

THE LUMMUS COMPANY

385 MADISON AVENUE, NEW YORK 17, N. Y.

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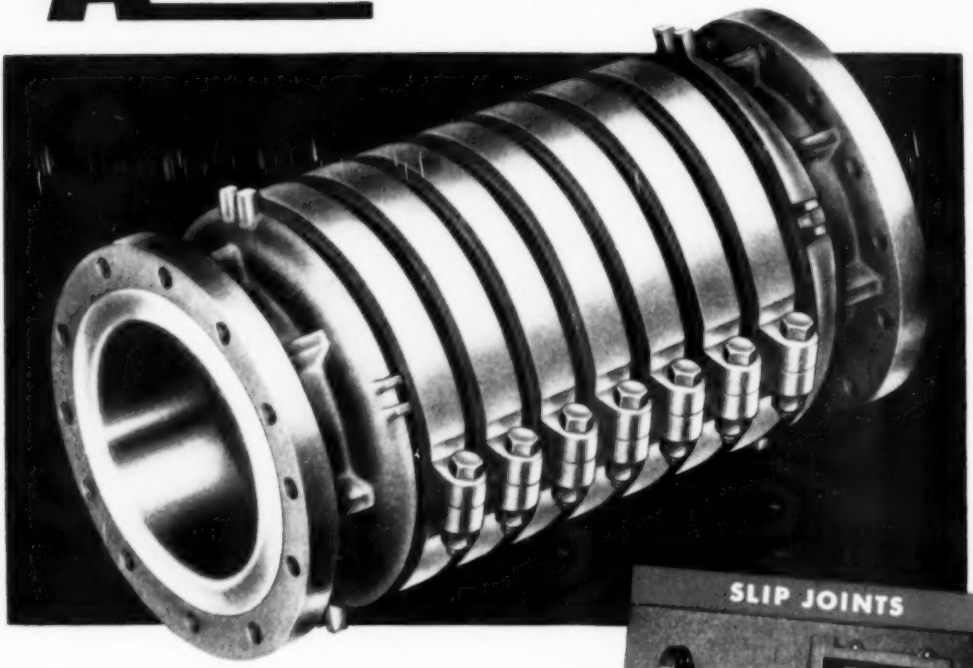
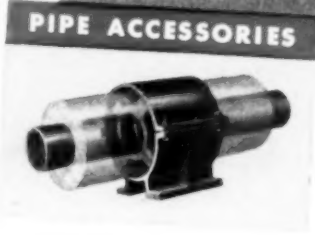
DESIGNING ENGINEERS AND CONSTRUCTORS FOR THE PETROLEUM AND CHEMICAL INDUSTRIES

(*To obtain more data on advertised products see page* 384)

ADSCO EXPANSION JOINTS





We don't have to sell what you don't want to buy, because only ADSCO makes a complete line of expansion joints. The modern Corruflex, shown above, is the result of 50 years' experience in packless expansion joints. Equalizing and non-equalizing Corruflex joints cover wide temperature and pressure ranges and are built in many designs, including universal, tie-rod, hinge, and fully-guided. They will solve nearly all pipe-expansion problems caused by temperature differential, whether the material in the pipes is liquid, gas, or steam. Write for Bulletin 35-51.

ADSCO
75 YEARS OF LEADERSHIP

AMERICAN DISTRICT STEAM COMPANY, INC.
NORTH TONAWANDA, NEW YORK

DU PONT

PETROLEUM CHEMICALS DIVISION NEWS

DU PONT

March ★ One of a Series of Interest to the Petroleum Industry ★ 1952

"New Look" for Du Pont Quarterly Motor Gasoline Survey

Just as gasolines are tailored to meet seasonal driving needs, the 1952 covers for Du Pont's Quarterly Motor Gasoline Surveys have been redesigned to portray the season in which they appear. This change is intended to make for quicker identification of any desired issues.

The January 1952 cover showed a snow-flaked winter service station scene. In the background was a map of the United States and Canada, indicating the extensive territory covered by the survey.

The April issue (due the week of April 21st) will carry out the seasonal theme with a spring scene.

Du Pont Historical Highlights

When the Du Pont Company was founded a century and a half ago, Federal Government income came almost entirely from customs duties. Taxes on the cost of manufacturing were almost unknown. Income, excess profits, franchise, sales, use, inheritance and social security taxes did not exist.

State taxes were levied chiefly on property and the State of Delaware's entire tax collection in 1802 amounted to less than $15,000 and total Federal income was $15 million.

Recent additions to the Du Pont Experimental Station alone cost more than $30 million, or twice as much as the entire Federal income in the year the Company was founded. And even the new Du Pont Petroleum Laboratory facilities would have taken a substantial bite from Uncle Sam's 1802 income if that gentleman had been required to pay the bill.

New Planning Staff will Coordinate Du Pont Facilities to Meet Petroleum Industry Needs

Because of the tremendous growth of the petroleum industry during the past decade, Du Pont is expanding its efforts to anticipate, as well as meet, the industry's petroleum chemicals requirements.

PLANNING MANAGER

T. BALDWIN PRICKETT was recently appointed Planning Manager of the Du Pont Petroleum Chemicals Division.

Mr. Prickett's previous activities and experience as refinery technologist for the division make him well qualified to take over his new duties of coordinating Du Pont's facilities to meet current and future needs of the petroleum industry.

His broad experience in chemical manufacturing includes work with the National Aniline and Chemical Company and the Pennsylvania Salt Manufacturing Company.

In 1931, Mr. Prickett joined Socony-Vacuum Oil Company and became assistant plant engineer in charge of initial development of the Houdry catalytic cracking process. He later became associated with the Houdry Process Corporation and affiliates as vice-president.

Just before he came to Du Pont in 1946, Mr. Prickett was in charge of commercial development of the Houdry process. He also directed the engineering, plant operations, and catalyst manufacturing activities of the Houdry Corporation.

To activate this program, the Du Pont Petroleum Chemicals Division recently organized a full-time planning staff.

Among the aims of this group will be long-range plans to assure ample supplies and convenient deliveries of all gasoline additives, plus the consideration of new product development to meet specific industry needs. These activities will complement the work of the Du Pont engineering laboratories and technical, automotive and other Du Pont petroleum industry service groups.

BROAD INDUSTRY STUDIES

To help keep the Du Pont Company informed on the growth and trends of the industry it serves, the planning group will base its studies not only on tetraethyl lead production, but on the broad foundation of all other factors contributing to supply and demand trends in the petroleum industry. Such a project calls for comprehensive studies of transportation facilities, technical refining developments and sources of supply for raw materials. Automotive and aviation engineering trends will be considered, too.

Although extremely broad in scope, the program is expected to result in many practical benefits for refiners. And, as the only manufacturer of a complete line of gasoline additives, Du Pont is keenly interested in continuing to serve the industry on as comprehensive a scale as possible.

To help accomplish the goal, the Du Pont Petroleum Chemicals Division is supported by research facilities that rank among the world's largest. Cooperating with these facilities on the development of new products to meet petroleum industry needs will be an important function of the new planning group. And the group will be constantly working to make Du Pont petroleum chemicals more exactly tailored to your specific refinery needs.

ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

PETROLEUM CHEMICALS DIVISION
NEWS

New Du Pont Book Helps Small Refineries Set Up Safety Programs

"How can we set up an effective safety program in our refinery?"

That was a question frequently asked Du Pont by refinery operating plants with up to 2,000 employees. With a long established safety history and a keen interest in furthering safety throughout industry, Du Pont is regarded as a logical source of help in safety planning.

As a result of many requests, Du Pont recently published "Safety for the Small Refinery"—a 42-page book prepared with the help and cooperation of the National Safety Council. It tells, step by step, how to set up an effective refinery safety program and, more important, how to use the wealth of safety material available to refiners.

MANAGEMENT FUNCTION

While the foreman is a key man in any good industrial safety program, safety is also an important *function* of every job. And most important of

all, the safety program must gain its driving force from the active participation and interest of top management.

In this connection, the new Du Pont book outlines a basic safety philosophy around which refinery management can build its own policy. It also contains a suggested plan for setting up a refinery safety council of executives, and a safety committee drawn from plant personnel.

The book lists a wide range of general safety material available from the National Safety Council and the American Petroleum Institute. Typical monthly and yearly refinery safety programs are outlined in detail—on a day-by-day basis.

A copy of "Safety for the Small Refinery" is available to you through the nearest Du Pont Petroleum Chemicals Division district office.

DU PONT TANK CLEANING CLINIC GOES ON TOUR

Based on the request of a large oil company, the Operations Group of the Petroleum Chemicals Division has set up a discussion clinic on the hazards connected with entry of leaded storage tanks.

B. GARDNER CRANE, Director of the Du Pont Petroleum Chemicals Division Operations Group, conducting a typical refinery safety clinic.

Headed by B. Gardner Crane who directs the Du Pont Operations Group and Dr. Stewart L. Rankin, chief medical advisor to the Petroleum Chemicals Division, the clinic recently completed a tour of five refineries operated by the company requesting the service. The meetings met with enthusiastic approval, and the Operations Group is now prepared to take the clinic on tour for other refiners interested in the service.

Essentially, the clinic is a safety review program for terminal managers and group leaders directly concerned with tank cleaning. Informal, yet broad in scope, it discusses the main problems and precautions involved in cleaning leaded storage tanks.

COMPREHENSIVE PROGRAM

Basically, the clinic program covers the following:

1. Toxicity of tetraethyl lead compounds.
2. Order of magnitude of TEL hazards in leaded gasoline storage tanks.
3. Description of lead-free tank for purpose of entry without protective equipment . . . for both "cold" and "hot" work. The exceptions are also covered.
4. The mechanics of tank cleaning, including sludge disposal problems.
5. Description of use and limitations of Du Pont Lead-in-Air Analyzer.
6. Emergencies in handling tetraethyl lead compounds.
7. Question and answer session.

The program is quite flexible and can be readily varied to meet individual plant or company needs.

For information regarding the Du Pont Tank Cleaning Clinic, get in touch with your Du Pont Petroleum Chemicals Division district office.

Literature—Movies Available

Here is a partial listing of the movies, bulletins, reports, booklets and aids available to you through the nearest Du Pont Petroleum Chemicals Division district office:

Safety for the Small Refinery — A 42-page book on how to set up an effective small refinery safety program. Serial A-2848

Tank Talk — A 32-page, easy-to-understand safety booklet for tank-cleaning crews. Serial A-1134

Prints of the following Du Pont films are available to oil companies for training and public relations purposes. They may be borrowed or purchased.

Pipeline on Wheels — A 26-minute, full-color movie on tank truck safety. Suitable for both training and public relations purposes.

What makes a Gasoline Good — An 18-minute cartoon movie in color. Presents, in easy-to-understand form, the story of how high quality gasoline is made. Ideal for dealer training meetings.

In addition, Du Pont makes available a special library of films of particular interest to the petroleum industry.

DU PONT

Better Things for Better Living
. . . through Chemistry

Petroleum Chemicals

E. I. DU PONT DE NEMOURS & COMPANY (INC.)
Petroleum Chemicals Division • Wilmington 98, Delaware

District Offices: New York, N. Y. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · Los Angeles, Calif.

District Laboratories: Wilmington, Del. · Chicago, Ill. · Tulsa, Okla. · Houston, Texas · El Monte, Calif.

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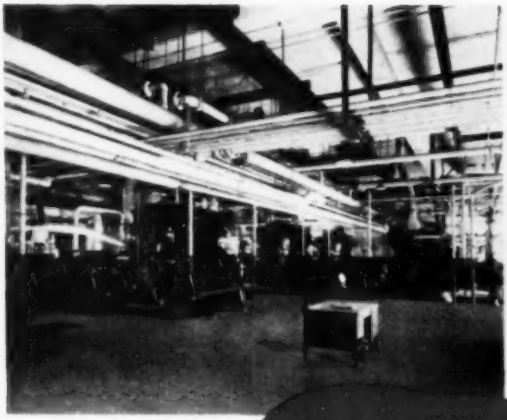
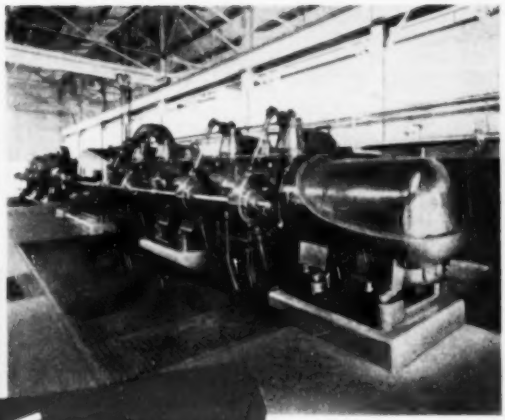
ADVERTISEMENT—Prepared for the Petroleum Chemicals Division of E. I. du Pont de Nemours & Company (Inc.)

A-3142

Printed in U. S. A.



The Pure Oil Company. A group of Cooper-Bessemer 4-cylinder, 400 hp GMV's, now going on 8 years of service in Pure Oil's Toledo refinery.

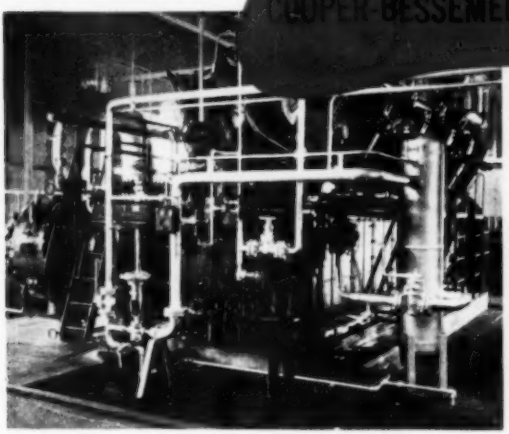


Humble Oil & Refining Company. Installed back in 1936, these two Cooper-Bessemer Type 26 horizontal gas engines drive hot oil pumps.

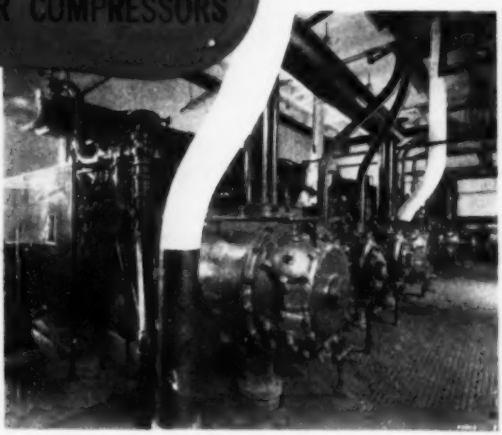
A Top Team through the years...

KELLOGG ENGINEERING and COOPER-BESSEMER COMPRESSORS

The Texas Company. One of six modern Cooper-Bessemer V-angles, 1000 hp GMV's in refinery service at this company's Eagle Point refinery, Westville, N. J. A duplicate plant has just been completed at Lawrenceville, Ill.



Continental Oil Company. View shows 600 hp GMV-8 and 800 hp GMV-8 handling air, recycle gas and propane in Continental's Ponca City, Oklahoma plant.



The above installation photos show only a few of the many Cooper-Bessemer compressor units that are serving faithfully, economically on jobs engineered by The M. W. Kellogg Company. Here at Cooper-Bessemer, we take pride in the fact that this successful association extends back many years, that we can continue to offer The M. W. Kellogg Company and their many fine customers engine and compressor performance that is unexcelled.

New York, N. Y. Washington, D. C. Bradford, Penna. Parkersburg, W. Va.
San Francisco, Calif. Houston, Dallas, Gregston, Pampa and
Odessa, Texas Seattle, Wash. Tulsa, Okla. Shreveport, La.
St. Louis, Mo. Los Angeles, Calif. Chicago, Illinois Caracas, Venezuela

The
Cooper-Bessemer
Corporation

MOUNT VERNON, OHIO — GROVE CITY, PENNA

meet our partner

A few weeks ago, a long, tall Texan opened a valve in a pipeline on the outskirts of Longview, Texas. The whistle of the gas, as it started through that valve, marked the opening of a new division of the Eastman Kodak Company—Texas Eastman Company.

At the far end of the pipeline is a supply of gas from the greatest proven reserve of any oil field in the United States—the great East Texas Field. At the Longview end—the new Eastman chemical plant which will convert the natural gas and propane into potentially hundreds of chemicals vital to the production of textiles, plastics, lacquers and safety glass, to name but a few.

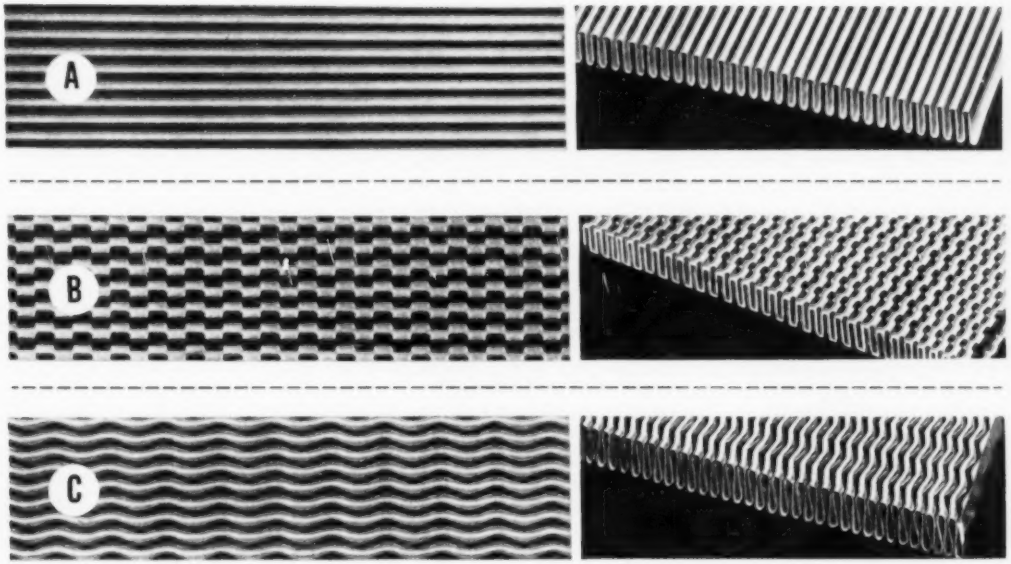
Texas Eastman is a separate division of Eastman Kodak Company. All of its products, however, will either be used by or sold through Tennessee Eastman Company. For the most part, these products will provide Tennessee Eastman with an economical source of raw materials for the manufacture of Tenite plastics, Eastman acetate yarns and fibers and the constantly expanding group of Eastman Industrial Chemicals.

▼

We are proud of our unbroken production record, and proud of our reputation for dependability. In a large sense, it is because of this pride that Texas Eastman Company has been built. For in so doing, we have assured ourselves of an uninterrupted flow of economical raw materials—and the supply of raw materials is the foundation of dependability.

Tennessee Eastman Company
Division of Eastman Kodak Company,
KINGSPORT, TENNESSEE

Manufacturers of TENAMENE — the most effective gasoline additives known.



Three of the many types of fin section available.

TRANE Brazed Aluminum Heat Exchangers Offer Wide Choice of Heat Transfer Surfaces for Greater Design Flexibility

With Trane Brazed Aluminum Heat Exchangers, you choose from a great variety of surfaces in solving exactly your heat transfer problems. They may be straight and continuous (A). They may be serrated (B). Or they can be of herringbone design (C). With these basic designs, exactly the right surface can be selected to provide the correct ratio of heat transfer to pressure drop characteristics.

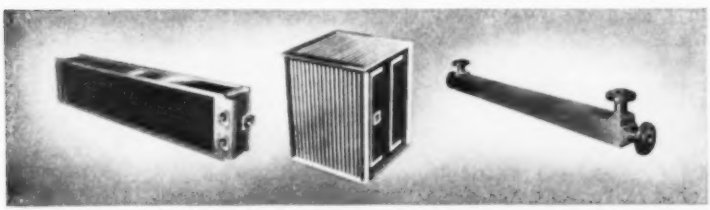
Many further variations of these general types are practical. The height and the thickness of the fin can be varied. So can the number of fins per inch. In fact, fins with entirely different patterns, heights and number of corrugations per inch can be used side-by-side to handle different fluids in the same exchanger.

Thanks to this great flexibility you can provide just the heat transfer, just the pressure drop volume, velocity number and direction of passes you want with Trane Brazed Aluminum Heat Exchangers.

Design flexibility is but one of the many advantages of Trane Brazed Aluminum Heat Exchangers. Compared to conventional exchangers, they produce more heat transfer efficiency in $\frac{1}{4}$ the space with $\frac{1}{3}$ the weight at approximately $\frac{1}{2}$ the cost.

These all-aluminum heat exchangers are rugged, too. They take test pressures up to 1,000 pounds per square inch and temperatures from −300° to 500° F.

Whether the job calls for high or low temperatures or pressures, one stream or many, Trane Brazed Aluminum Heat Exchangers can be the answer. Contact your Trane sales office or write direct.



Here are a few of the many varieties of Trane Brazed Aluminum Heat Exchangers which are now in actual service: 1) A cross flow unit for liquid-to-gas exchange used for condensing purposes. 2) A cross flow gas-to-gas unit which is used for intercooling for aircraft engines. 3) A counter flow liquid-to-liquid exchanger for high pressure application.

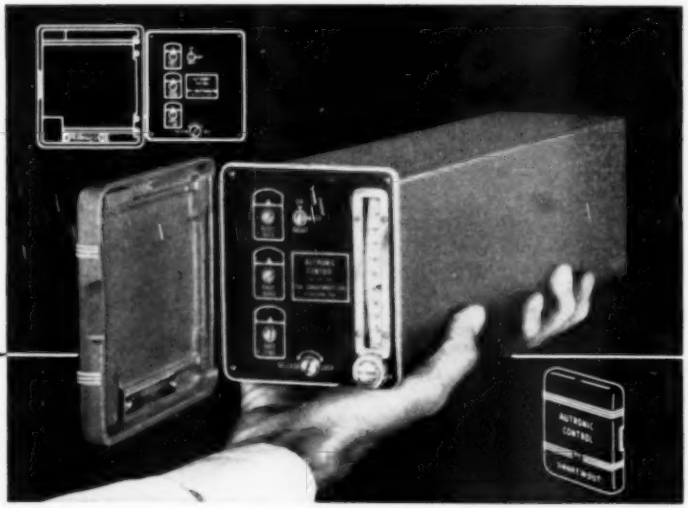
TRANE

MANUFACTURING ENGINEERS
OF HEATING, VENTILATING AND
AIR CONDITIONING EQUIPMENT

THE TRANE COMPANY, LA CROSSE, WIS.
Eastern Mfg. Division . . . Scranton, Pennsylvania
Trane Company of Canada, Ltd. . . . Toronto

OFFICES IN 80 U. S.
AND 14 CANADIAN CITIES

(To obtain more data on advertised products see page 384)



accurate . . . instantaneous

all-electronic instrumentation

• No matter how fast a pneumatic or electro-mechanical control system may function, it cannot compare with the *instantaneous, all-electronic response of the Swartwout Autronic Control System.*

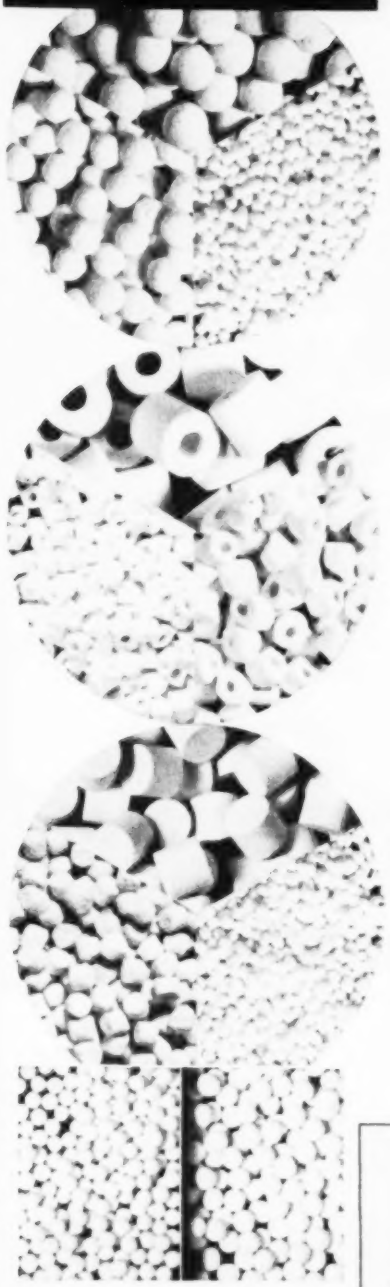
Heart of the system is the compact, plug-in type Autronic Controller. All-electronic operation means it has no mechanical motion whatsoever . . . no slide wires, boosters or motors to initiate control action . . . no air lines from the measuring element or to the final element. Hence the Autronic Controller eliminates all transmission lags . . . spans distance between primary and final elements *without interval.* Accurate, positive calibration gives the Autronic Controller complete interchangeability . . . eliminates any need for recalibrating, adjusting or trimming.

Call in our engineering representative to explain how the Autronic Control System can bring new accuracy to your process or power instrumentation. Or write *today* for literature on the new Swartwout Autronic Control System.

Swartwout *Autronic* **CONTROL SYSTEM**

SEND FOR BULLETIN A-701 • THE SWARTWOUT COMPANY • 18511 EUCLID AVENUE • CLEVELAND 12, OHIO

To meet varying needs, Norton catalyst supports are available in spheres, rings, and pellets.



Spheres can be obtained with either smooth or rough surfaces.

For Greater Yield or Lower Costs Investigate Norton Catalyst Supports

Products of 40 years of pioneering in the development of special refractories, Norton catalyst supports come in a variety of materials, structures, shapes, and sizes that cover practically every known requirement for these vital aids to modern chemical processing.

In particular, Norton spherical supports provide a bed of exceptionally uniform composition for the passage of gas, thereby reducing channelling and pressure drop to a minimum. Spheres are made in diameters of $\frac{1}{4}$" to $\frac{3}{4}$" of the following Norton refractory materials: ALUNDUM*, CRYSTOLON*, MAGNORITE*, FUSED STABILIZED ZIRCONIA, and MULLITE. Each material has its own special properties as a catalyst support, and each has the chemical stability and purity that eliminates contamination of both catalyst and end products.

Also obtainable in these materials are Norton supports in ring or pellet form, in diameters of $\frac{1}{8}$" to 2". Like the spheres, they have the high refractoriness and resistance to abrasion that insure long service life. Important advantages of all Norton catalyst supports are: controlled structure, highly suitable for coating or impregnation; porosity ranging up to 50%; and, in spheres, a choice of rough or smooth surfaces.

Make a Thorough Test

of Norton catalyst supports. Find out what they will do to improve your production through greater yield or lower costs. See your Norton representative or write direct for samples, describing your applications. Norton Company, 595 New Bond St., Worcester 6, Mass.

Canadian Rep. A. P. GREEN FIRE BRICK CO., Ltd. Toronto, Ont.

*Trade Marks Reg. U. S. Pat. Off. and Foreign Countries

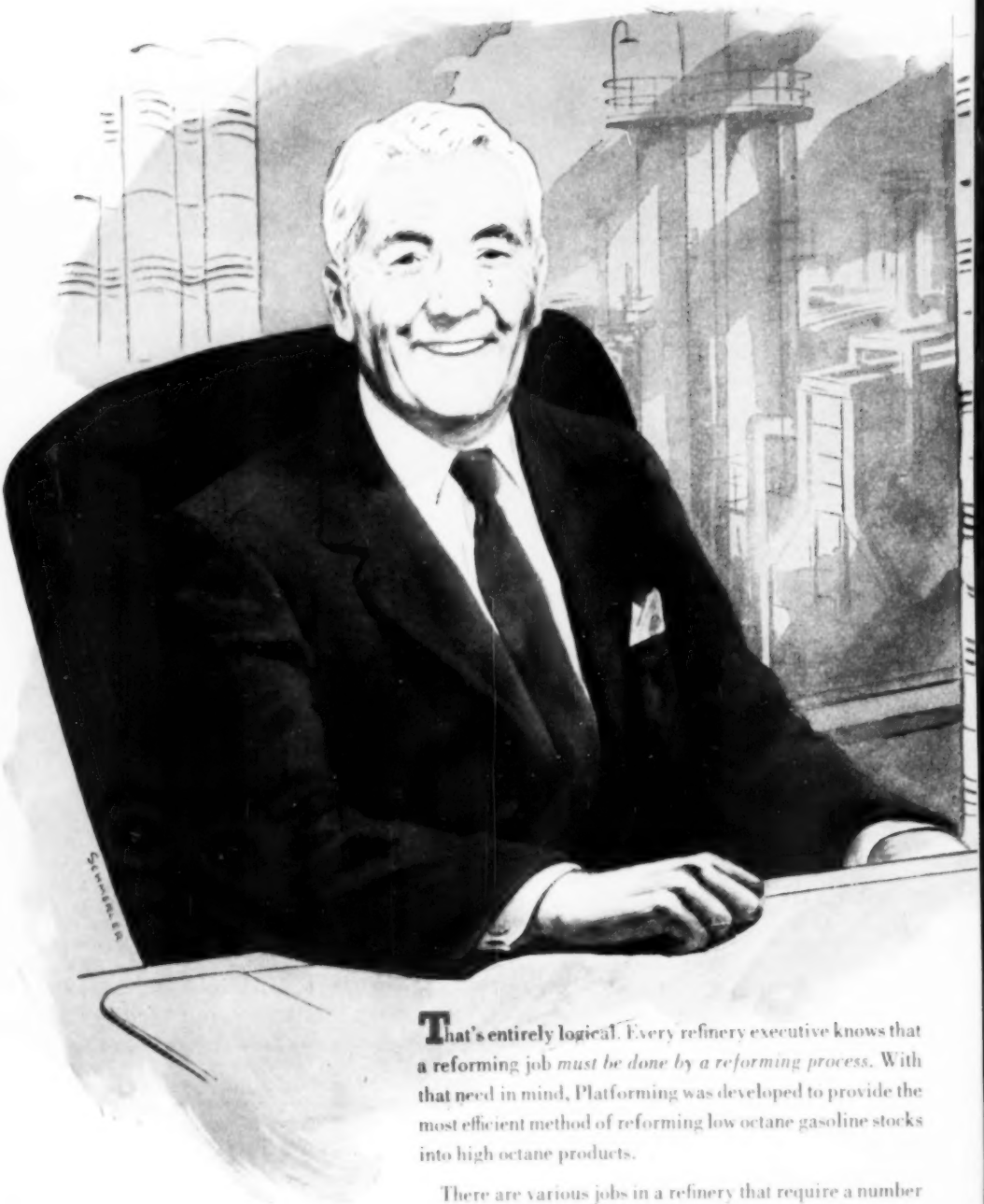
NORTON

Special REFRACTORIES

Making better products to make other products better

NORTON COMPANY, WORCESTER 6, MASSACHUSETTS

(To obtain more data on advertised products see page 384)



That's entirely logical. Every refinery executive knows that a reforming job *must be done by a reforming process.* With that need in mind, Platforming was developed to provide the most efficient method of reforming low octane gasoline stocks into high octane products.

There are various jobs in a refinery that require a number of different processes. Where reforming is needed, Platforming fits the requirement perfectly. It is a true reforming process . . . specifically designed, engineered and constructed to meet the particular needs of that job.

we had to do a reforming job

so naturally we bought

PLATFORMING

The number of Platforming units now operating, and the acceptance accorded Platformed gasoline at the point-of-sale is certainly convincing proof of Platforming's success in doing the job for which the process is intended.

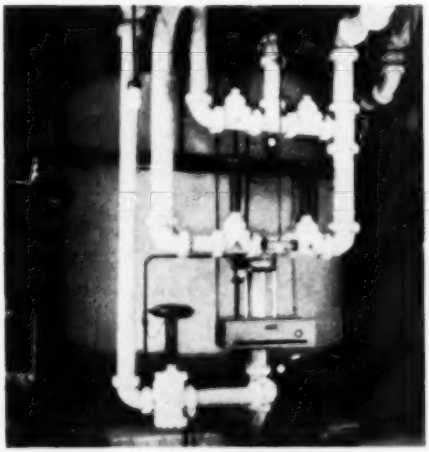
UNIVERSAL OIL PRODUCTS COMPANY

General Offices: 310 S. MICHIGAN AVE., CHICAGO 4, ILL., U.S.A.

LABORATORIES: RIVERSIDE, ILLINOIS

Universal Service Protects Your Refinery

(To obtain more data on advertised products see page 384)



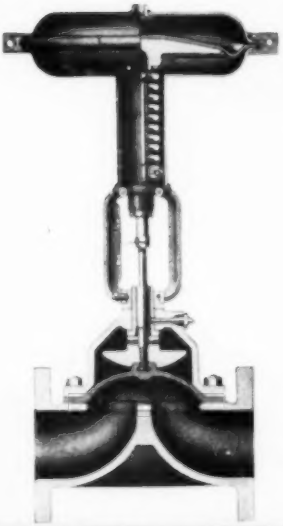
HOW K & M VALVES HELP "SOFTEN UP" 120,000 GALLONS OF HARD WATER PER HOUR

The mineral salts in hard water can cause extremely costly damage to the boilers of a power plant.

At one of America's most important industrial plants, a massive installation of cation and anion exchangers "softens up" or demineralizes water at the rate of 120,000 gallons per hour, thus protecting the steam generators.

The big exchanger units are complicated and require trustworthy regulation of flow at many points. 125 K & M Saunders-Type valves in the assembly do the job with safety, certainty and precision. Moreover, the installation has been so successful that the company is building a similar one, for which K & M valves are also being used.

Leaders in many industries look to K & M valves for proved sensitivity and endurance. K & M is geared to handle the smallest or largest problem in control valves, however exacting the requirements. Our engineers invite your inquiries.



K&M

KIELEY & MUELLER, INC.

Valve Makers Since 1879

2033 - 43rd STREET NORTH BERGEN, N. J.

FACT

An average-size refinery can save $50,000 in first cost by using Alcoa Aluminum Heat Exchanger Tubes!

(Figured on 20,000 Tubes)

This is based on current tube prices . . . ⅓ less than seamless mild steel, ½ as much as Admiralty, ⅙ the cost of stainless. Compare these savings in aluminum against the metal you now use.

ALCOA

knows most about their use and application

Alcoa pioneered the use of aluminum in heat exchanger tubes 43 years ago. Although their sale today is limited by government regulation, you will want to start planning with a copy of the booklet, "Alcoa Aluminum Heat Exchanger Tubes". Write:

ALUMINUM COMPANY OF AMERICA
1863C Gulf Building • Pittsburgh 19, Pa.

OVER 6-MILLION FEET OF ALCOA TUBES ARE IN USE FOR APPLICATIONS LIKE THESE . . .

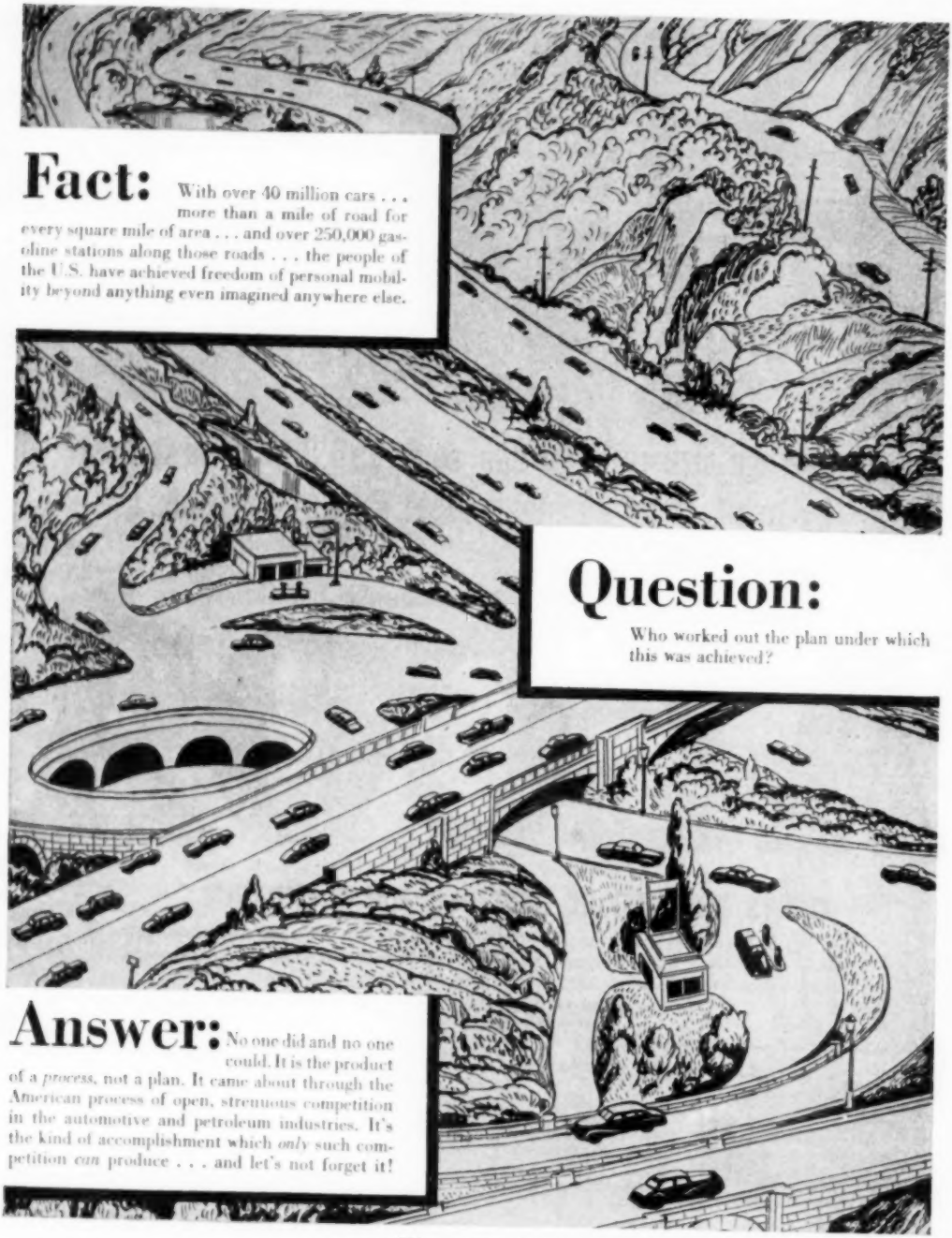
PETROLEUM

Condensers handling hydrocarbon fractions from such processes as Thermal and Catalytic cracking, reforming, polymerizing, etc.
Vapor recovery condensers
Lube oil coolers
Natural gas compressor aftercoolers
Recompressor aftercoolers
Hydrogen sulfide gas coolers
Furfural condensers and heat exchangers
Propane chilling
Wax sweaters
Lean oil—rich oil exchangers
Amine solution coolers
Glycol-amine solution coolers, heat exchangers and reboilers

CHEMICAL

Butanol
Ethanol
Ethylene Glycol
Glycerin
Hydroabietyl
Isopropanol
Methanol
Phenol
Propylene Glycol
Acetaldehyde
Formaldehyde
Furfural
Heptaldehyde
Acetic acid
Stearic, Palmitic, Maleic Oleic acids
Butyric acid
Naphtha
Ricinoleic acid
Acetanilide
Ammonia
Hydrogen Cyanide
Nitric acid (concentrated)
Pyridine
Hydrogen Sulfide
Benzene
Dichlorobenzene
Gasoline
Gelatin
Hydrogen Peroxide
Turpentine
Xylene

Use Alcoa Alclad 3S-H14 Heat Exchanger Tubes with fresh, brackish and salt-cooling waters



Fact: With over 40 million cars . . . more than a mile of road for every square mile of area . . . and over 250,000 gasoline stations along those roads . . . the people of the U.S. have achieved freedom of personal mobility beyond anything even imagined anywhere else.

Question:

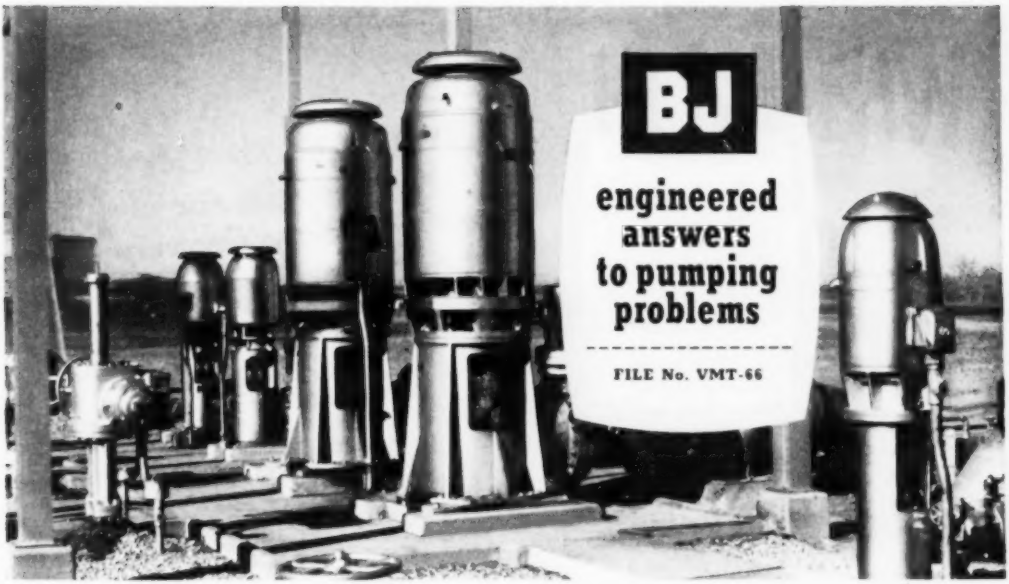
Who worked out the plan under which this was achieved?

Answer: No one did and no one could. It is the product of a *process*, not a plan. It came about through the American process of open, strenuous competition in the automotive and petroleum industries. It's the kind of accomplishment which *only* such competition *can* produce . . . and let's not forget it!

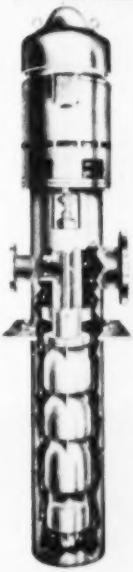
This report on PROGRESS-FOR-PEOPLE *is published by this magazine in cooperation with National Business Publications, Inc., as a public service. This material, including illustration, may be used, with or without credit, in plant city advertisements, employee publications, house organs, speeches or in any other manner.*

The competitive system delivers the most to the greatest number of people

(To obtain more data on advertised products see page 384)



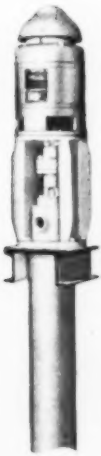
Boiling point temperatures and limited NPSH pose no problem for these VMT pumps!



WHEN PUMPING FLUIDS at boiling point temperatures, the problem of sufficient net positive suction head often requires expensive installation to raise the vessel from which the pump would draw or to excavate a pit to lower the pump.

This is eliminated with the BJ "VMT" pump because the vertical multi-stage pumping unit is mounted in a barrel from which it takes a suction. The base of the pump is at ground level while the length of the barrel is determined by the NPSH requirement.

The "VMT" pumps (shown above) serving as boosters from gasoline tank farm to main line stations are just one of the many successful applications for refineries, pipelines, fueling stations, power plants, and process industries. For more detailed information on how the "VMT" may solve your pumping problem, call your local BJ sales office or send the coupon below.



FILE FACTS:

- Capacities to 5000 gpm. Heads to 250 psi. Temperatures from sub-zero to 750° F.
- Handles corrosive or non-corrosive liquids
- Radial forces balanced at all speeds
- Adjustable coupling for easy, accurate impeller setting

Also available in the smaller "VLT" model (capacities to 110 gpm). Provides the same basic construction and installation advantages as the "VMT," yet is priced for general purpose application.

Byron Jackson Co.

Since 1872

P.O. Box 2017, Terminal Annex, Los Angeles 54, Calif.

OFFICES IN PRINCIPAL CITIES

BJ Pump Division, Dept. 26
Please send me Bulletin No. 51-6600 on your VMT pump.

NAME_____

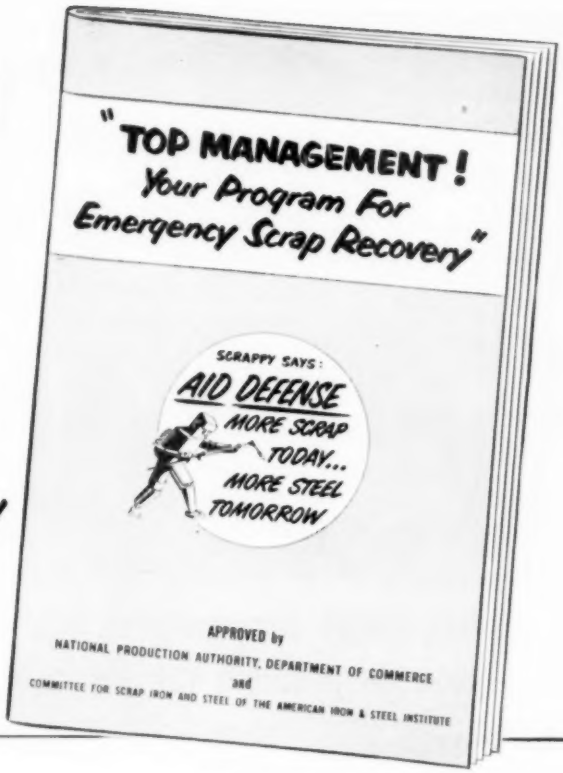
FIRM_____

ADDRESS_____

CITY_____ ZONE___ STATE_____

What YOU can do... Must do

to ease the critical iron and steel scrap problem


"TOP MANAGEMENT! Your Program For Emergency Scrap Recovery"
SCRAPPY SAYS:
AID DEFENSE
MORE SCRAP TODAY...
MORE STEEL TOMORROW
APPROVED by
NATIONAL PRODUCTION AUTHORITY, DEPARTMENT OF COMMERCE
and
COMMITTEE FOR SCRAP IRON AND STEEL OF THE AMERICAN IRON & STEEL INSTITUTE

It's a problem calling for the assistance of every thoughtful business man—now.

Unless the steel mills get more scrap . . . furnaces may have to be shut down.

Shut down—at a time when our armed forces need more and more equipment . . . when civilian demands for steel are greater than ever . . . when our economy is fighting desperately against inflation!

You Can Help. Yes . . . regardless of the business you're in . . . you're in the scrap business, too.

If you're in the steel-fabricating business, you have extra *dormant* scrap to be added to your *production* scrap.

If you're in any other business, you surely have idle metal that will do you—and America—more good being fed into furnaces than cluttering up your premises.

Write for Suggestions. The booklet shown here tells how to set up a Scrap Salvage Program with least amount of effort and minimum interference with your regular operation. It tells where to look for scrap, what to do with it when you get it.

You are urged to send for the booklet now. Use the coupon.

FACTS ABOUT SCRAP SALVAGE

Steel production	1950 — 97,800,000 net tons
Estimated capacity	1952 — 119,500,000 net tons
Purchased scrap used *	1950 — 29,500,000 gross tons
Estimated purchased scrap requirement *	1952 — 36,200,000 gross tons

*All consumers

Where will the extra tonnage come from? Mostly from your *dormant* metal—obsolete machines and structures, tools, jigs, fixtures, gears, wheels, chains, track.

NON FERROUS METAL NEEDED, TOO:

A PUBLIC SERVICE PROJECT THE ADVERTISING COUNCIL

This advertisement is a contribution, in the national interest, by

PETROLEUM PROCESSING

Advertising Council
25 W. 45th St.
New York 19, N. Y.

Please send me a copy of the free booklet: "Top Management: Your Program for Emergency Scrap Recovery".

NAME .....

COMPANY ..... TITLE .....

ADDRESS .....

CITY ..... ZONE ..... STATE .....

"CC" Combination Cooling Units for Medium Capacity Cooling and Condensing
Engine Jacket Water Coolers
"HSC" Spiral Tube Type Large Capacity Cooling and Condensing Units
1927 • 1952
25 YEARS OF PROGRESS IN HEAT TRANSFER ENGINEERING
Young Quality
Fixed and Removable Type Shell and Tube Heat Exchangers
"HC" Tube and Fin Type Large Capacity Cooling and Condensing Units
Evaporative Type Coolers and Condensers
"Mono-Weld" Sectional Type Steel Tank and Side Member Radiators

YOUNG

Heat Transfer Products for Automotive and Industrial Applications

Heating, Cooling, and Air Conditioning Products for Home and Industry.

DEPT. 262-C RACINE, WISCONSIN

Factories at Racine, Wisconsin and Mattoon, Illinois

OIL FIELD DISTRIBUTORS

TULSA: J. R. Monk Company, 1341 S. Boston St., Rm. 109
LOS ANGELES: Flournoy & Everett, Inc., 5043 Santa Fe Ave.
MUSKEGON: Harold J. Young, 206 Montgomery Bldg.
Other Representatives in Principal Cities

(To obtain more data on advertised products see page 384)

with *Nalcat*® **MS**

CRACKING CATALYST

Here's why:

You get excellent fluidity, with low losses of Nalcat MS Catalyst because of controlled particle size distribution. This, plus high resistance to attrition and high activity, gives you maximum catalyst efficiency and economy.

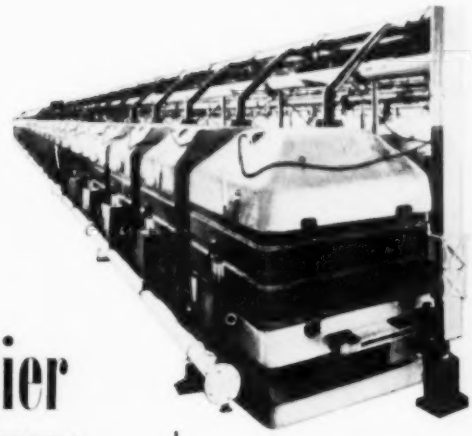
Write, now, for data on Nalcat MS Catalyst for use in your catalytic cracking unit.

Nalcat **MS AND GROUND CRACKING CATALYSTS**

CATALYST DIVISION—NATIONAL ALUMINATE CORPORATION
4003 West 71st Street • Chicago 29, Illinois

(To obtain more data on advertised products see page 384)

Hooker Chemicals stem from the Type "S" Cells at Niagara Falls and the high-capacity Type "S-3" Cells at Tacoma. In these cells, the highly efficient electrolysis of salt brine produces raw materials of high purity and constant uniformity, in quantity, for use by more than 30 U.S. industries.



HOOKER - basic supplier of INTERMEDIATES . . .

These Hooker Chemicals are widely used as intermediates by many process industries.

Starting point for all Hooker intermediates is the highly efficient Type "S" Cell. Used by Hooker and by many licensees, the "S" Cell has increased the domestic production and commercial supply of these and other chemicals.

Hooker serves you with strategically located plants and distributing stations; careful control of shipments; skilled customer service. This well-balanced supply "package" has pleased many users.

For the complete list of Hooker Chemicals, send for Bulletin 100. For properties, specifications and uses of any chemicals listed here, ask for Technical Data Sheets. Please request them on your business letterhead.

A WORD ABOUT DELIVERIES—Production of Hooker Chemicals is at an all-time peak, and plant facilities are being expanded to meet your needs as promptly as possible. For up-to-date delivery information, we suggest that you keep in touch with your Hooker sales representative.

- Benzal Chloride
- Benzoic Acid
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- Benzoyl Chloride
- Benzyl Chloride
- Chlorobenzenes
- Chlorotoluene
- Lauryl Chloride
- Monochloroacetic Acid
- m-Nitrobenzoyl Chloride
- p-Nitrobenzoyl Chloride
- Phenyl Isocyanate
- Sodium Benzoate
- Sodium Sulfhydrate
- Thionyl Chloride

From the Salt of the Earth

HOOKER ELECTROCHEMICAL COMPANY

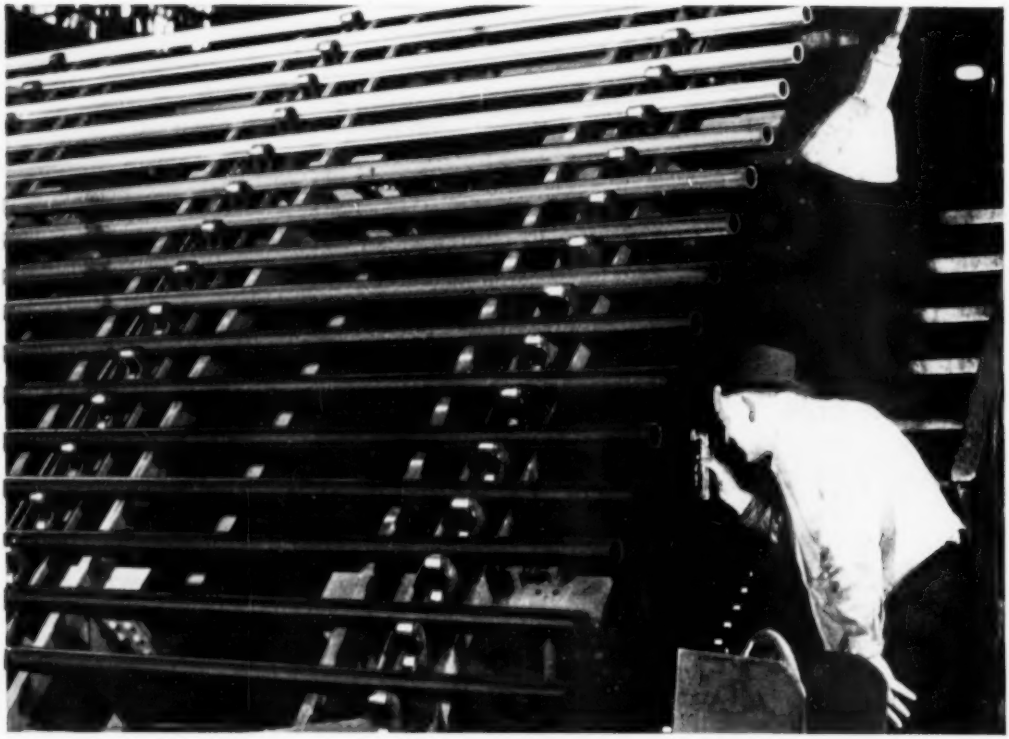
4713 BUFFALO AVE., NIAGARA FALLS, N. Y.

New York, New York • Wilmington, California • Tacoma, Washington

HOOKER CHEMICALS

1-516

ALUMINUM CHLORIDE, ANHYD. • CAUSTIC SODA • CHLORINE • MURIATIC ACID • SODIUM SULFIDE • SULFUR CHLORIDES • SULFURYL CHLORIDE



SPECIALIZATION **GIVES YOU UNIFORM HIGH QUALITY IN**

GLOBE ALLOY STEEL TUBES

GLOBE TUBES

When you specify GLOBE you get the finest, because Globe *specializes* in the production of steel tubes. For more than thirty years Globe *specialized* research, engineering and manufacturing facilities have assured customers of uniform high quality in alloy steel tubes for pressure or mechanical applications.

GLOBE STEEL TUBES CO., Milwaukee 46, Wis.

Chicago • Cleveland • Detroit • New York • Philadelphia
St. Louis • Denver • San Francisco • Glendale, Cal.

Producers of Globe seamless stainless steel tubes — Globeweld welded stainless steel tubes — alloy — carbon — stainless steel tubes — Globeiron high purity ingot iron seamless tubes — Globe Welding Fittings.

TYPICAL ANALYSES:

Carbon Moly
1-1/4 Chrome 1/2 Moly • 1-3/4 Chrome 3/4 Moly
2 Chrome 1/2 Moly • 2-1/4 Chrome 1 Moly
5 Chrome 1/2 Moly • 7 Chrome 1/2 Moly
9 Chrome 1 Moly
AISI 1335 • AISI 2317 • AISI 2512 •
AISI 4130, 4140 • AISI 4615 • AISI 8615,
8620, 8630, 8635, 8640 • 2% Ni. • 3½% Ni.

TYPICAL APPLICATIONS

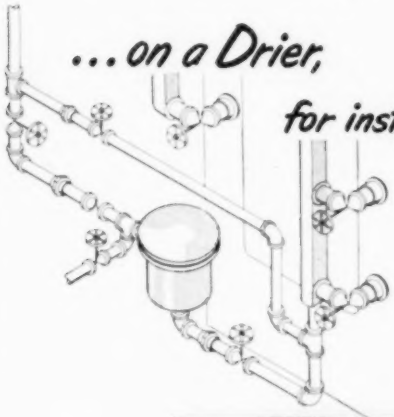
Pressure Tubes — Superheater Tubes — Condenser Tubes — Still Tubes — Evaporator Tubes — Barrel Tubes — Oil-Well Pump Barrels — Mechanical Tubes — Aircraft Tubes—Rollers for Transmission Chains

GLOBE SEAMLESS TUBES FOR MAXIMUM STRENGTH AND MINIMUM WEIGHT

Pierced from solid steel billets . . . with no seams or welds. Globe seamless tubes are available in many sizes and wall thicknesses for exacting applications.

Example of Steam Trap Durability

...on a Drier, for instance



THE INSTALLATION

On heavy-duty, steam-heated tumbler-type drier at American Linen Supply Company, Cincinnati.

THE HISTORY

A high discharge capacity trap was needed to operate this drier 16 hours daily under heavy loads, with 125 psi. steam. Specifications called for rapid, fully automatic condensate removal to insure fast warm-ups and a steady flow of hot, dry steam to the drier. Naturally, the lowest possible trap maintenance cost was also wanted.

The choice was a Crane 150-Pound Inverted Open Float Steam Trap, carefully selected for adequate drainage capacity, and above all, properly installed.

In service more than 8 years and never needing any repairs or new parts, the Crane trap has given complete satisfaction. Total maintenance expense: periodic routine inspection only.

TRAP SERVICE RATINGS

SERVICE LIFE:
More than 8 years - Heavy duty

SUITABILITY:
High discharge capacity

MAINTENANCE COST:
None - Routine inspection only

SPECIAL FEATURES:
Simple, dependable mechanism

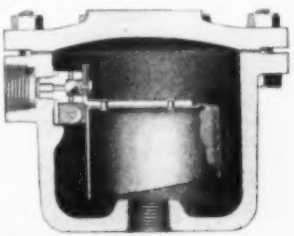
OPERATING RESULTS:
Fast warm-ups - Steady, even heat

PRICE:
Good Buy

AVAILABILITY:
Stock item in Crane line

THE TRAP

Crane Iron Body Inverted Open Float Steam Trap, for 1 to 300 pounds saturated steam working pressures. Small and compact in all sizes, yet has high discharge capacity. Patented ball-type seating gives positive pressure seal. Simple operating mechanism with only one moving unit assures durable, trouble-free performance. See your Crane Catalog or your Crane Representative for complete data on these highly efficient traps.



The Complete Crane Line Meets All Valve Needs. That's Why,

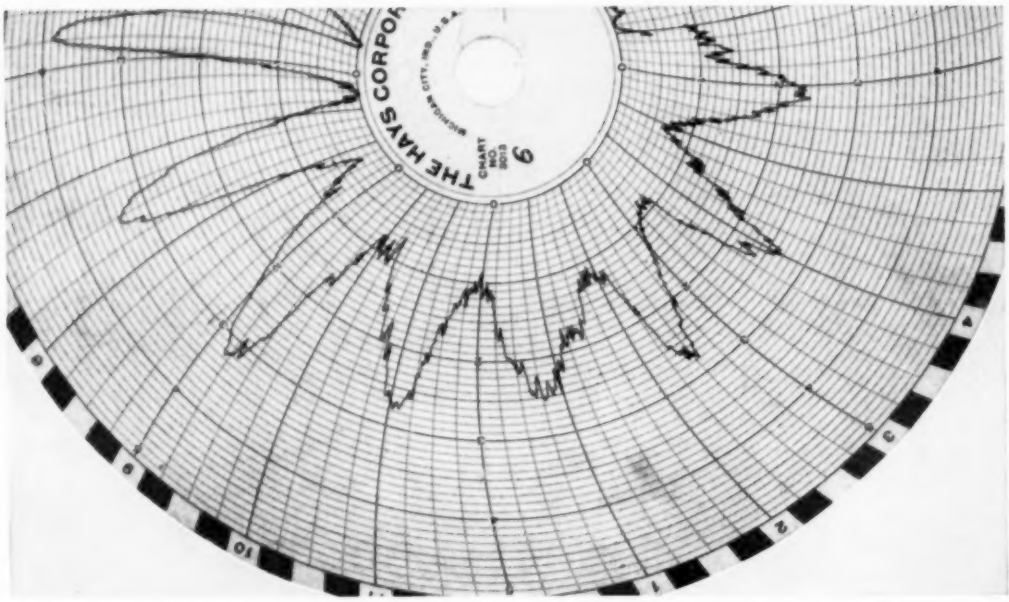
More Crane Valves Are Used Than Any Other Make!

CRANE VALVES

CRANE CO., *General Offices:* 836 S. Michigan Ave., Chicago 5, Illinois
Branches and Wholesalers Serving All Industrial Areas

VALVES • FITTINGS • PIPE • PLUMBING • HEATING

Portrait of a "team" at work



Swings show efforts of new crew before catalyst regenerator was brought to point of operation through use of Hays Magno-Therm O_2 Recorder. Note that swings are smaller at right of chart indicating that stability is being approached.

The chart illustrated above was produced during the starting-up period of a new catalyst regenerator. The wide "swings" on the chart graphically illustrate the efforts of the "team"—a new crew and their Hays Magno-Therm Oxygen Recorder—to operate the unit efficiently. Their problem: To achieve continuous, stable operation thus avoiding "after burning" (excess O_2) which would damage the catalyst and the regenerator as well as too little burning (deficient O_2) which would not effectively regenerate the catalyst.

Solution

Answer to this problem was the "team" operation by crew and Hays Magno-Therm Oxygen Recorder. The "team" now maintains the O_2 content of the effluent gases between 5% and 2.0% thereby producing effective catalyst without damaging the multi-million dollar installation.

The operating crew could do this because the Magno-Therm O_2 Recorder reflects, without lag and in a direct and magnified manner, changes in the amount of excess air present, thus making control a simpler task. No longer need the crew attempt to operate with only indirect, small temperature changes as a guide.

For process heaters and boiler plants

The Hays Magno-Therm Oxygen Recorder has also been successfully and *profitably* applied to process heaters and refinery boiler rooms where multiple fuel firing is a problem.

With the Hays Magno-Therm Oxygen Recorder you get:

• Freedom from effect of varying Hydro-Carbon ratios of different fuels • Continuous, highly accurate indication and recording • Complete compensation for temperature and pressure effects • Freedom from chemicals or hazardous fuel burning in the analyzing process • Swift, sure electronic operation

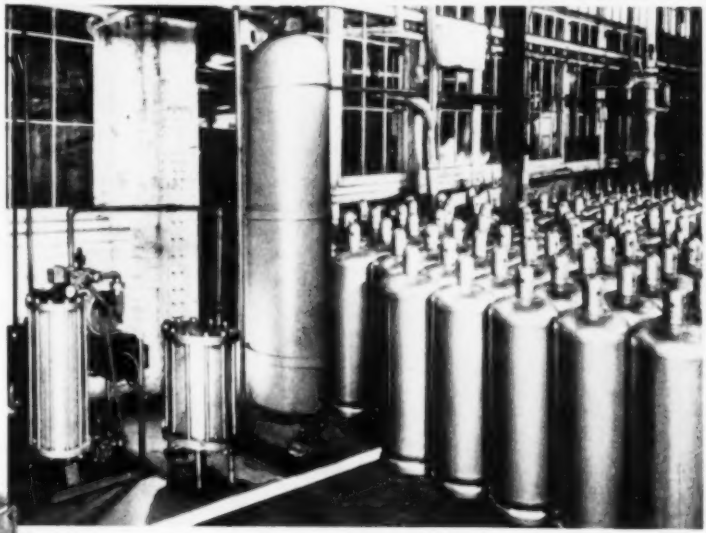
Hays Bulletin 51-829 tells the complete story of the Magno-Therm. Write for it.

THE **HAYS** CORPORATION
MICHIGAN CITY 23, INDIANA

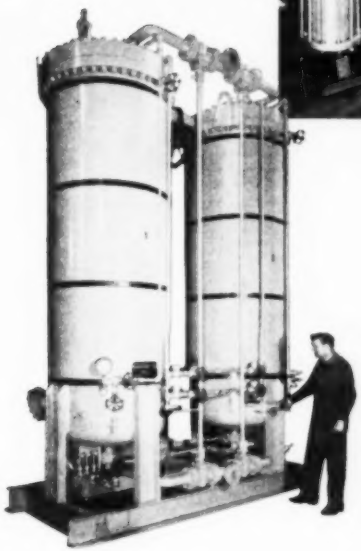
Automatic Combustion Control • Boiler Panels • Hays-Penn Flowmeters
Veriflow Meters and Veritrol • Gas Analyzers • Draft Gages
Combustion Test Sets • CO_2 Recorders • Electronic Oxygen Recorders

To keep your gas refinery-dry

LP-Gas cylinders are tested with DRY air



This Lectrodryer and Lectrofilter deliver DRY, CLEAN air to the stand where LP-Gas cylinders are given a final test at John Inglis Company, Ltd., Toronto, Ontario.



Lectrodryers like this are placed on-stream in refineries to make the DRYing operations continuous. All functions can be automatic.

Consumers of LP-Gas are increasingly insistent that the gas delivered to them is DRY. Freeze-ups that result from moisture in the gas are hazardous, as well as a bother. That's why John Inglis Company uses air dried by a Lectrodryer* to avoid introducing moisture when testing their gas cylinders.

Refineries are similarly depending on Lectrodryers to DRY their LP-Gas before it goes into storage or shipping containers. Dewpoints of -50° F. are quite common in the industry.

Whether your problem is DRYing gases, air or organic liquids, there's a Lectrodryer to solve it. Our engineers can relieve your men of much of the responsibility on this very specialized work. Lectrodryers have been proved for many years on thousands of DRYing assignments.

Write Pittsburgh Lectrodryer Corporation, 332 32nd Street, Pittsburgh 30, Pennsylvania.

In England: Birtec, Limited, Tyburn Road, Erdington, Birmingham.
In Australia: Birtec, Limited, 51 Parramatta Road, Glebe, Sydney.
In France: Stein et Roubaix, 25 Rue Erlanger, Paris XVI.
In Belgium: S. A. Belge Stein et Roubaix, 320 Rue du Moulin, Brasseur-Liege.

LECTRODRYERS DRY WITH ACTIVATED ALUMINAS

LECTRODRYER

*REGISTERED TRADEMARK U. S. PAT. OFF.

Delivered at Home . . .

where a man has time to read!

Refinerymen like *Petroleum Processing*'s home delivery. It gives them the expert know-how they need, at the time and place they can study best. And the unique *Home Secretary* reply card permits readers to inquire about advertised products conveniently from their homes.

Distribution of *Petroleum Processing* is restricted to a management-built list. Only refinerymen designated by top executives of their companies as buying factors are eligible. Ninety per cent of the more than ten thousand copies are *home delivered* every month . . . never meet the fate of unread, routed office mail.

To reach refinerymen who make or influence decisions on processes and equipment, make your first choice *Petroleum Processing* . . . the youthful, aggressive, readable magazine that's delivered *at home* where a man has time to read!

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REACHING THE MOST REFINERY READERS

A Platt Petroleum Publication

Headquarters, 1213 W. Third St., Cleveland 13, Ohio . . . Offices in New York, Chicago, Philadelphia, Houston and Los Angeles

(To obtain more data on advertised products see page 384)

Three

waste water problems solved by

GRAVER

REACTIVATOR

Here was a particularly difficult problem of high solids in waste water in a large eastern process plant.

This waste water contains up to 1500 ppm of suspended solids and 3000 gpm were to be treated. The problems were:

(1) to prevent stream pollution,

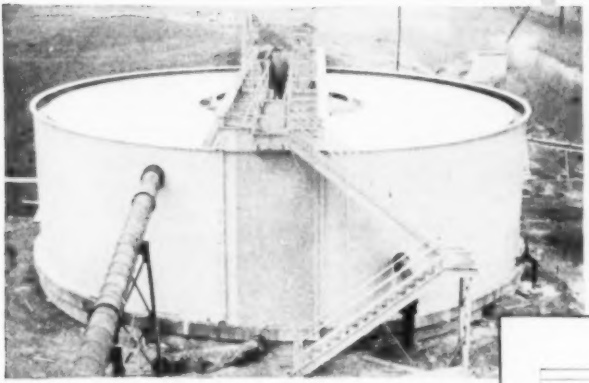
(2) to produce solids of the highest concentration for disposal,

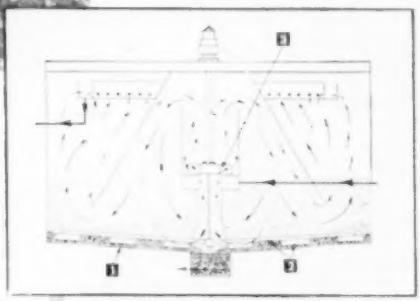
(3) to recover clear water for process use.

A Graver Reactivator was selected to solve this multiple problem. The Reactivator is doing the job so effectively that it delivers solids up to 14% by weight while producing an effluent suitably clear for recycling in the system, *without any chemical treatment.*

In plants all over the country, Graver Reactivators are effectively and economically treating raw water supplies and conditioning waste waters for reuse or for trouble-free disposal. These units can solve *your* liquid conditioning problem, too. Their distinctive design is described in Bulletin WC-103.

Write today for a copy and for free technical paper, "Some Economic Factors in Waste Water Treatment".





Three exclusive Graver Reactivator Features

1. *Full bottom area for solids concentration and collection.*
2. *Separately driven highly efficient sludge scraper and blades.*
3. *Positive and intimate contact of incoming water with sludge by variable speed sludge recirculation impeller.*

GRAVER WATER CONDITIONING CO.

Division of Graver Tank & Mfg. Co., Inc.

216 WEST 14th STREET, NEW YORK 11, N. Y.

GRAVER

GW 456

Have You Taken This Opportunity for

COLONEL, RESEARCH AND DEVELOPMENT DIVISION, DEPARTMENT OF THE ARMY: "Full support should be given any sound measure designed to encourage inventors and facilitate consideration and further development of their ideas or inventions. It is difficult to conceive of any action that would accomplish more in this direction than that called for in the Sinclair Plan."

CABINET MEMBER: "It should bring to light some valuable ideas which might otherwise not have been known."

AN INVESTMENT COUNSELOR: "I can imagine the great surge of hope now going through the breasts of the young men specializing in this field. 'Here,' they will say, 'is a corporation willing to give us a break.' . . . Its fundamental unselfishness cannot fail to strengthen the faith of those without property. . . . This is opportunity!"

AN AIR FORCE GENERAL: "I have read of your plan for encouraging invention and offering a testing ground for ideas. Such a project seems to me both practical and inspirational!"

A CABINET MEMBER: "The provisions regarding patents are unique . . . the compensation for your investment of money, time, and facilities would be limited to nonexclusive, royalty-free shop rights for your company."

Men Who Know the Importance of Independent Invention Encourage You to Use the Sinclair Plan

A MEMBER OF THE JOINT CHIEFS OF STAFF: "The Sinclair Oil Corporation is performing another fine public service in opening its research laboratories to the American inventor. I am confident that the nation will derive many benefits from this selfless service."

PRESIDENT OF A BROADCASTING NETWORK: "To make the magnificent facilities of the Sinclair Research Laboratories available to inventive Americans under what would seem to be a very fair arrangement is a constructive and forward-looking step."

PRESIDENT OF LARGE MANUFACTURING CORPORATION: "We all think the plan, which opens wide the doors of your great research laboratories, should indeed encourage individual inventors."

AN AIR FORCE GENERAL: "I wholeheartedly agree that there is a need to help the independent inventor because of the complexity of modern technology and the prohibitive cost of these facilities. Your farsighted plan is a great stride in relieving this situation."

PRESIDENT OF A LARGE MANUFACTURING COMPANY: "You have recognized a great need, and have done something objective to overcome it . . . another idea which puts to beneficial use the resources and capacity of a large group."

(To obtain more data on advertised products see page 384)

Advantage of Independent Inventors?

If you have an idea for a new petroleum product—but do not have the facilities needed to develop it—the Sinclair Plan offers you laboratory help.

Eight months ago, Sinclair opened up a part of its great research laboratories to independent inventors who had ideas for new or improved petroleum products but who did not have the facilities needed to develop and profit by their ideas.

To date nearly 5,000 inventive people have submitted ideas to the laboratories; and the Sinclair Plan has become recognized as a service to inventors, the oil industry and the public. As a result we have made the Plan part and parcel of the long-range operation of our company.

If you have an idea for a new or improved petroleum product or application, you are invited to submit it to the Sinclair Research Laboratories. In your own interest, each idea must first be protected by a patent application or a patent.

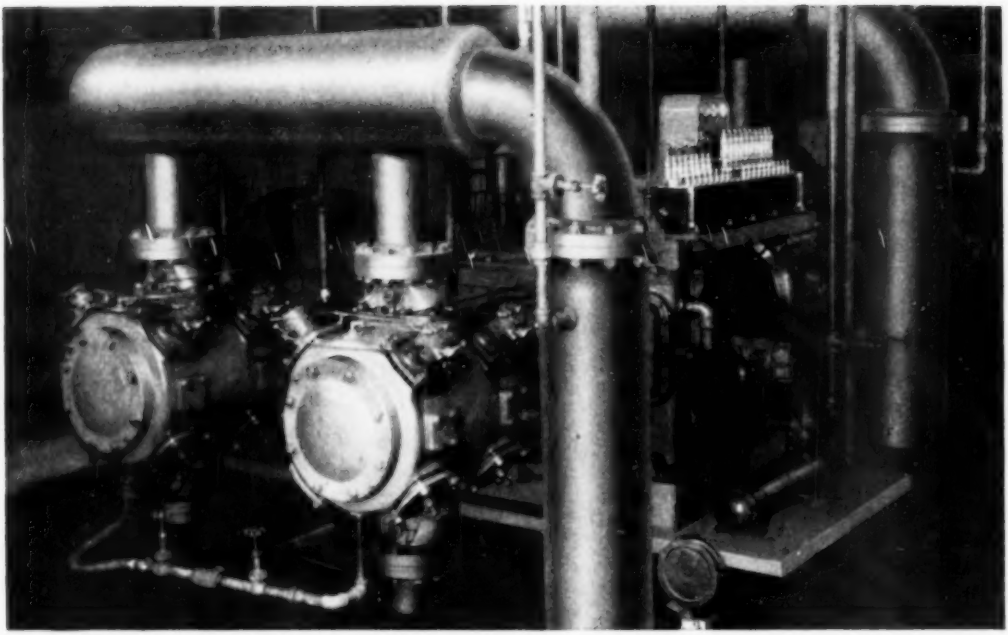
If the laboratories select your idea for development, they will make a very simple arrangement with you: In return for the laboratories' work, Sinclair will receive the privilege of using the idea for its own companies, free from royalties. This in no way hinders the inventor from selling his idea to any of the hundreds of other oil companies for whatever he can get. Sinclair has no control over the inventor's sale of his idea to others, and has no participation in any of the inventor's profits through such dealings.

HOW TO PARTICIPATE: Instructions are contained in an Inventor's Booklet. Write to W. M. Flowers, Executive Vice-President, Sinclair Research Laboratories, Inc., 600 Fifth Avenue, New York 20, N. Y.

IMPORTANT: *Please do not send in any ideas until you have sent for and received the instructions.*

Nine buildings of the Sinclair Research Laboratories at Harvey, Ill.

SINCLAIR—for Progress



SAVINGS... even before the word GO!

Great Lakes Refining selects the compressors that simplify erection and firewall installation

When Great Lakes Refining Co. was planning its new Houdriflow cat cracking unit at Blue Island, Illinois, one of the prime requirements was a low fire hazard compressor installation for vapor recovery service.

What type of compressor should be used? The decision was easy after Clark engineers made a thorough analysis carefully considering gas and steam engine driven units, motor driven reciprocating units and centrifugal compressors. Building all types of compressors, Clark was unusually qualified to make this comparison—*impartially!* Recommendation: Two Clark CMA-4, 300 bhp, Balanced/Opposed, Synchronous Motor Driven Compressors.

Of major importance was adaptability to firewall type construction. Having a single unit crankcase with the driving motor on the end, it would be a simple matter to isolate the motor from the Clark Balanced/Opposed Compressor. The shaft would merely extend through the firewall, with a simple packing gland sealing out the gas.

Costwise, Great Lakes Refining was ahead from the day the order was placed. Considerable time and cost in installation were saved by shipping the unit completely assembled. Vibration-free operation —*the result of perfect balance*— paid off in smaller foundation cost and will *continue* to pay off in practically maintenance-free operation.

For details on this truly modern compressor, write for Bulletin No. 118. For complete information on *all* your compressor problems, call in the nearest Clark representative for an unbiased answer.

CLARK BROS. CO., INC. • OLEAN, N. Y.

One of the Dresser Industries

Gas-engine-Driven • Steam-engine-Driven • Motor-Driven • Centrifugal

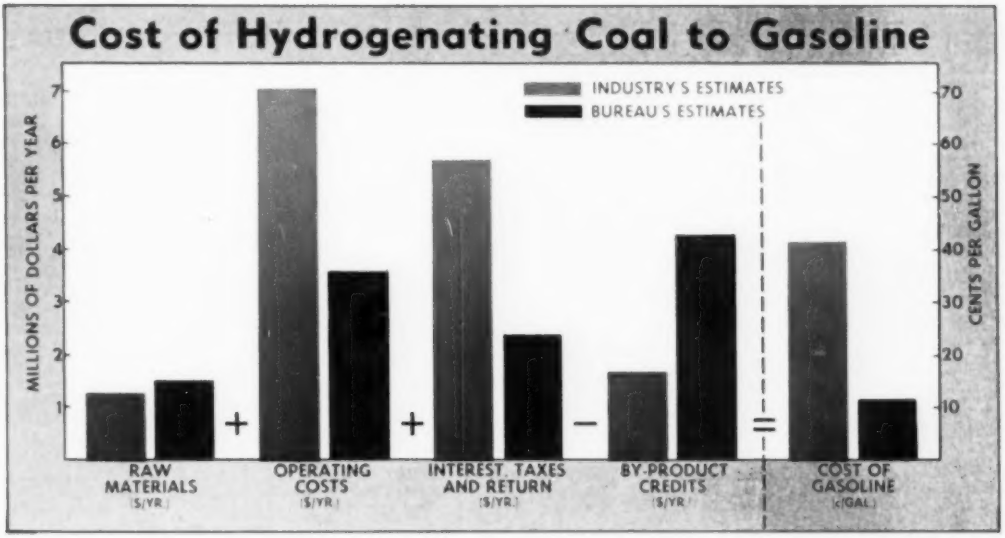
Birmingham • Boston • Buffalo • Chicago • Detroit • Houston • Los Angeles
New York • Pittsburgh • Salt Lake City • San Francisco • Tulsa • Washington

Offices in Principal cities throughout the World

CLARK®

balanced/opposed
COMPRESSORS

(*To obtain more data on advertised products see page* 384)



Industry's vs. Bureau's Figures

NPC brands Bureau's 12c/gal. estimate for gasoline from coal as 'fictitious, misleading'

FURTHER evidence to support its contention that gasoline by the coal hydrogenation route would cost 41c a gallon, not the 12c gal. claimed by the U. S. Bureau of Mines, has been compiled by the National Petroleum Council's committee on synthetic liquid fuels production costs.

In its latest "Interim Report," presented at the NPC meeting in Washington Jan. 29th, the committee analyzes the four major points of difference between its figures and those prepared by the Bureau:

1—NPC's estimate of capital investment required is $121,500,000 more for a 27,000 b/d plant than the Bureau's figure for a 30,000 b/d plant.

2—NPC's estimate of annual operating labor and maintenance costs are $10,768,000 greater.

3—Bureau is counting on chemical by-products for more than half of total revenue.

4—Bureau's figures allow only $23,386,000 for interest, federal income taxes, and return on investment, compared with $56,718,000 allowed by NPC.

The first detailed report of the committee's study of the cost of synthetic liquid fuels, dated Oct. 15, 1951, was presented at the NPC meeting last Oct. 31. The complete report has not yet been made public, but some of the figures released at that time were published in the December issue of PETROLEUM PROCESSING ("Outside Engineering Firm to Audit Bureau's Synthetic Cost Data," p. 1380).

At the same time the Bureau released its own report entitled "Cost Estimate for Coal Hydrogenation," dated Oct. 25, 1951. Subsequently the Oct. 25 report was replaced by one dated Nov. 19, which dropped all data on a West Kentucky coal hydrogenation plant and concentrated only on a Rock Springs, Wyo. plant.

Both Bureau reports claimed that gasoline could be produced by coal hydrogenation for about 12c/gal.

In its latest report, the NPC committee charges that "the revised report of the Bureau of Mines on Nov. 19, 1951 has contributed nothing to indicate that cost of gasoline from coal hydrogenation should be lowered from 41c/gal. as reported by your committee. It appears that the Bureau of Mines greatly understated its operating, investment and capital costs, and at the same time overstated its product revenue, resulting in a fictitious and misleading cost of gasoline."

The following details on the four major points of difference outlined above have been condensed by PETROLEUM PROCESSING from the NPC report.

Capital Investment

The NPC study of Oct. 15 estimated total investment cost for a 27,000 b/d plant as being $532,900,000—$19,700 per bbl. of daily capacity. The Bureau's Nov. 19 study estimated $411,440,000 for a 30,000 b/d plant—$13,700 per bbl. of daily capacity.

There is a difference of 121.5 million dollars between these two figures, principally a result of the following:

1—The Bureau estimated the cost of plant facilities to be $47.5-million less than NPC, even though the Bureau's plant had 11% more capacity and included aromatic extraction facilities.

2—The Bureau allowed $55 million less for housing than did NPC.

3—Allowance for working capital, start-up ex-

pense, and other capital charges was $19-million less in the Bureau's estimate.

Plant Investment Information in the latest Bureau report is so meager that it is impossible to reconcile current investment estimate with that summarized in the Bureau of Mines Report of Investigation 4561 ("Estimated Plant and Operating Costs for Producing Gasoline by Coal Hydrogenation," August 1949). The "conventional" plant investment estimate given in RI 4561 was $306,748,000. The latest estimate indicates that modifications have been made to three major units in the "conventional" plant. Correcting this investment for these three units brings the revised estimate to $288,419,000.

Further adjustments are necessary to bring the figure up-to-date. The increase in the construction index since the RI 4561 figure was compiled has been 14%. The earlier figure was based on a 27,000 b/d plant; to increase capacity to 30,000 b/d, the NPC committee estimates, would add 6%. In addition, steam and power requirements for the coal hydrogenation facilities were incorrectly determined by the Bureau in their latest report and would account for another 7%. Summing up these increases, the original $288,419,000 becomes $370,000,000. On top of that, NPC estimates that to correct for the inadequacies of the original Bureau estimate would add $60- to 70-million more.

The Bureau's current estimate of these same facilities (excluding separation of aromatics and water facilities which were not in the earlier estimate) is $332,783,000.

Housing On this subject, a difference of philosophy seems to exist. The Bureau questions the validity of the NPC assumption that the plant owners should be responsible for the housing investment.

When considering the risk involved in the coal hydrogenation process, considerable independent authority has concurred in the NPC view that housing at Rock Springs would be a responsibility of the plant owner. There is almost a complete lack of housing and related services in this area. Such housing as is required rates as an extremely poor risk from the point of view of lenders or grantors of loans, who apply the following tests: (1) Are there nearby industries which would create a demand for this housing if the hydrogenation plant should not continue to operate? (2) Has this hydrogenation project adequate assurance of long range satisfactory earnings considered from the points of view of both proved processing and competition with flush crude oil production or other developments in the energy supply field?

Miscellaneous Capital Other capital requirements include working capital, start-up expense, process royalties, and interest during construction. NPC's estimate of the total for these items exceeded the Bureau's by about $19-million.

For working capital the Bureau provides $20-million, vs. NPC's $37.1-million. The NPC figure is slightly less than 10% on plant investment. For comparison, working capital of 30 oil companies compared by Pogue and Chipperfield averaged 19% on gross property, plant and equipment in 1950.

For start-up expense, NPC estimated that $18.5-million, amounting to only 4 months "out of pocket" operating costs, represents a reasonable allowance. The Bureau's only reference to start-up expense implies that this is included in investment cost.

Process royalties are, to date, only a matter of conjecture, and the Bureau was more conservative than NPC: $2-million vs. $1-million.

The Bureau included an expense of $15,677,000 for interest during construction, but NPC included no allowance for this expense.

Operating, Maintenance Costs

Operating Labor The NPC estimate required 238 men per shift to operate the plant, compared with the Bureau's estimate of 156 men per shift. The Bureau criticized the NPC estimates particularly with respect to manpower for the power plant, water system, oxygen plant, and tankage and loading.

For the steam power plant, NPC estimated 29 operators, giving due consideration to the fact that it was a coal-fired unit presenting problems with respect to coal handling and ash disposal. This estimate also included personnel for steam and power distribution. The Bureau quoted the number of operators for a similar size power plant to be between 10 and 18, based on data published in *Electrical World* for Aug. 27, 1951. An examination of that data indicates that in five plants of about *half* the electrical generating capacity of that required for the hydrogenation plant, the number of operators varied from 7 to 25. In addition, these plants were balanced with respect to generating steam for power and would not meet needs for process steam, and did not include operating personnel for steam and power distribution.

For the water system, NPC allowed for operators to man the pumping stations and pipe line outside the plant proper, for pumpers within the plant, and for cooling-tower operators. Apparently the Bureau ignored at least the operating personnel required outside the plant. Also, there is a basic difference in the water supply systems which partially accounts for personnel discrepancies. The Bureau planned on a 100-mile, $18-million line, using gravity feed. NPC decided on a 32-mile, $7.2-million line. Although the NPC line would have greater pumping requirements, an economic appraisal indicates the Bureau's line could never be justified.

For the oxygen plant, NPC estimated labor on the basis of several large oxygen plants now operating in the U. S. The Bureau's estimate of two men per shift was based on its experience in operating one 24-ton-per-day pilot plant, although the hydrogenation plant would require *four* 450-ton-per-day plants.

For tankage and loading, NPC estimated 13 men, including the pumpers, gagers and loaders required to handle all products from the plant. This figure was completely backed up by data from actual practice. The Bureau estimated 6 to 7 men, and apparently did not include pumpers and gagers. The NPC estimate took into account the facts that all shipments would be overland by tankcar and tanktruck, and that relatively large quantities of phenols and cresols (which have toxic properties) would have to be handled under special safety conditions.

Maintenance The largest error in operating costs made by the Bureau was its attempt to estimate maintenance labor as a ratio to operating labor. NPC based its maintenance estimate on a relationship to investment. As a result, the Bureau's total maintenance figure is equivalent to only 1.7% on total investment, compared to NPC's estimate of 3.9%.

As a rather simple example of the fallacy of attempting to correlate maintenance with operating labor, take the case of a half-ton panel delivery truck against a heavy-duty construction truck. One man can operate each unit, but to assume equal maintenance costs on each is an error which is readily apparent.

To justify the correlation of maintenance with plant investment rather than with operating labor, these factors are taken into account:

1. Maintenance is, in part, repairing and replacing items that have become worn as a result of operations. The repair employs the same type of labor and the same type of material as originally expended in building the plant, and therefore is closely related to construction cost.

2. Employing a high level of instrumentation or mechanization acts to reduce operating labor needs, but *increases* both construction and maintenance costs.

3. Maintenance also represents periodic inspection and turn-around costs required for continuously operating equipment. The higher the operating pressures and temperatures, the more detailed and exact these ac-

tivities become, and maintenance costs increase.

Other Operating Costs—The Bureau includes an overhead item of 16% on payroll for labor benefits, including vacations, social security, sick leave, workmen's compensation, etc. Actually, benefits being paid by integrated companies in the petroleum industry average about 20%.

Most of the remaining plant operating costs are based on the costs developed for direct operating labor and maintenance. This method of deriving total operating costs cannot provide a reasonable estimate when the basic factors are invalid.

By-Product Credits

The plant proposed in the latest Bureau report cannot properly be classed as a liquid fuels venture. The chemicals which are produced account for more than half of the total product income.

Tar Acids—With respect to tar acids, two areas of difference appear.

First, the Bureau's quantities are greater (except for o-cresol and xylenols) than NPC used. NPC used yield figures supplied by the Bureau at the time the NPC review was started. Since then the Bureau has revised its yield figures, but has not provided related yield, quality and materials balances.

Second, the Bureau's realizations are greater. NPC's figures were based on current prices, but took into account the effect on market of the relatively large supplies made available by the hydrogenation plant. On the other hand, the Bureau took current prices and assumed that markets at these prices could be developed by the time a hydrogenation plant was installed.

Aromatics—The Bureau's latest report provides for the extraction of benzene, toluene and xylenes, a step not included in the original design provided NPC for review. The original Bureau design contemplated 40-45% aromatics in the gasoline. The benzene, toluene and xylene extracted in the revised report amount to 15% of total gasoline components. This difference implies that the clear octane as well as the maximum leaded octane numbers of total gasoline would be considerably lower than had been originally estimated.

Return on Investment

The Bureau's representatives have been very critical of the financing method used by NPC to establish a cost of gasoline from coal.

It should be sharply emphasized that *manufacturing costs alone amount to 20c/gal. after full credit for by-products but without allowance for interest, income taxes, and return on investment*. Since the value of gasoline is now about 12c/gal., obviously there will be no profit to be applied to any capital, borrowed or equity. Accordingly, neither type of capital could be attracted to the venture.

The calculation of financing costs by NPC, based on the extremely low return of 6% after taxes on total investment, is included only to establish a minimum selling price for comparison with present gasoline prices.

If synthetic fuels plants are to be built by the petroleum industry without government subsidy, the Bureau's financing scheme (60% borrowed capital, 40% equity) is exceedingly unrealistic. Inasmuch as the per cent of borrowed capital in the petroleum industry is about 20%, an unproved operation such as a synthetic fuel plant could not expect a large proportion of borrowed funds without the guarantee of a financially responsible third party.

The low per cent of borrowed capital in the petroleum industry is due to the speculative nature of the business. Borrowed money must be paid back. Equity money is risked on the hope of success.

The Bureau argues that coal hydrogenation is not speculative because the coal reserves have been proven to exist in ample quantities. Finding crude oil, however, is only one of the many speculations in the liquid fuels industry. Obsolescence of techniques and facilities is a factor of great risk in the oil business, contrary to what the Bureau of Mines states.

A project costing approximately $500,000,000 and subject to being outmoded by improved techniques in other parts of the petroleum industry certainly has more elements of risk in it than is envisioned by the U. S. Bureau of Mines.

Comparison of National Petroleum Council Costs with Bureau of Mines Costs

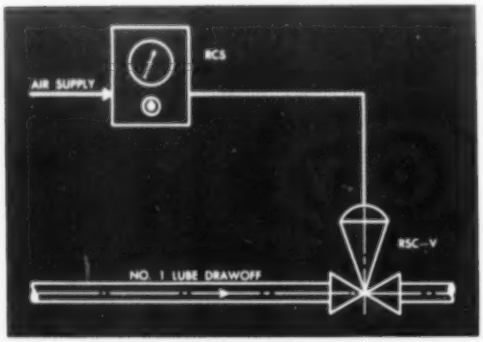
	National Petroleum Council—(Oct. 31, 1951)			Bureau of Mines—(Nov. 19, 1951)			NPC Excess over USBM cents per gallon. (Negative numbers in parenthesis.)
	Per calendar day	Per year	Cents/gal. of gasoline (298,781,700 gallons)	Per calendar day	Per year	Cents/gal. of gasoline (284,500,000 gallons)	
Raw materials:							
Coal							
Expenses	$ 26,302	$ 9,707,000	3.25	$33,425	$12,200,000	4.29	(1.04)
Depreciation	1,740	635,000	.21				.21
	28,333	10,342,000	3.46	33,425	12,200,000	4.29	(.83)
Catalyst and chemicals	6,507	2,375,000	.79	1,004	1,790,000	.63	.16
T.E.L.	200	76,000	.03	2,268	828,000	.29	(.26)
Total raw materials	35,040	12,793,000	4.28	40,507	14,818,000	5.21	(.93)
Operating costs:							
Operating:							
Labor	11,424	4,170,000	1.40	7,475	2,730,000	.96	.44
Supervision	1,714	626,000	.21	1,123	410,000	.14	.07
Material	2,964	1,082,000	.36	3,384	1,235,000	.43	(.08)
Maintenance							
Labor	27,853	10,093,000	3.38	11,277	4,116,000	1.45	1.93
Material	14,836	5,416,000	1.81	5,628	2,058,000	.72	1.09
Payroll extras	8,158	2,978,000	1.00	3,181	1,161,000	.41	.59
Utilities—credit	(1,214)	(445,000)	(.15)				(.15)
Overhead	29,271	10,684,000	3.58	14,452	5,275,000	1.85	1.73
Research and development	2,740	1,000,000	.34				.34
Local taxes and insurance	16,290	5,946,000	1.99	9,748	3,558,000	1.25	.74
Depreciation	55,246	20,164,000	6.75	40,707	14,858,000	5.22	1.53
Amortization of process royalties and start-up expense	2,671	975,000	.33				.33
Housing and community facilities—net	21,461	7,833,000	2.62				2.62
Total operating costs	193,191	70,515,000	23.62	96,980	35,401,000	12.43	11.19
Total costs	228,240	83,308,000	27.90	137,586	50,219,000	17.64	10.26
Interest, federal income taxes and return:							
Interest expense				23,672	8,640,000	3.04	(3.04)
Interest income				(11,836)	(4,320,000)	(1.52)	1.52
Federal income taxes	77,737	28,374,000	9.50	24,112	8,801,000	3.09	6.41
Return	77,737	28,374,000	9.50	28,123	10,265,000	3.61	5.89
Total interest, federal income taxes and return	155,474	56,748,000	19.00	64,071	23,386,000	8.22	10.78
Total cost and return	383,714	140,056,000	46.90	201,657	73,605,000	25.86	21.04
Less—Sales of by-products	45,171	16,488,000	5.52	113,905	42,305,000	14.87	(9.35)
Gasoline	$338,543	$123,568,000	41.38	$87,753	$31,300,000	10.99	30.39

Five Ways Instruments Pay

Specific instrument applications on a crude oil distillation unit can be shown to effect five fundamental economies: labor savings, utility savings, product quality and yield improvement, maintenance savings, and protection of personnel and equipment.

These five ways that instruments pay are designated by number in the simplified flow diagram of a typical still at right. It has a charge capacity of 30,000 b/d and produces straight run gasoline, naphtha, kerosine, distillate fuels, cracking stocks, neutral oil distillates, and residuum for heavy lubricating oil manufacture.

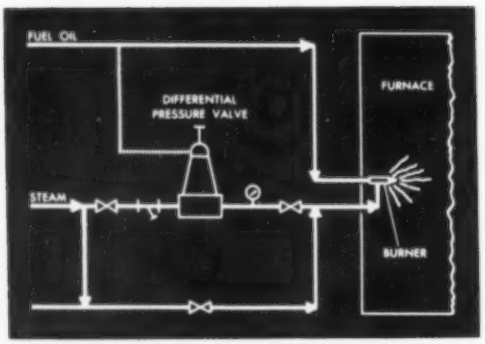
Information presented on these two pages is based upon a paper, "Management's Yardstick for Instrument Costs," by A. L. Keeler, R. P. Fay, E. D. Keiper, and S. V. Agnes, Socony-Vacuum Oil Co., Paulsboro, N. J., and presented at the Instrument Society of America, New York section, regional conference on "Power Plant Instrumentation," New York, February 7-8.



1—Labor Saving

Remote station control valve, *RSC-V* in sketch, located on a lube distillate rundown line between vacuum tower and steam stripper, controls product quality and yield of the distillate stream. A pneumatically actuated valve, it is positioned by an operator in the control room by varying air supply pressure at control point, *RSC*. Adjustments may be prompted by any of the following change in rate or nature of the crude charge; unit upsets; change in product specifications; equipment failure.

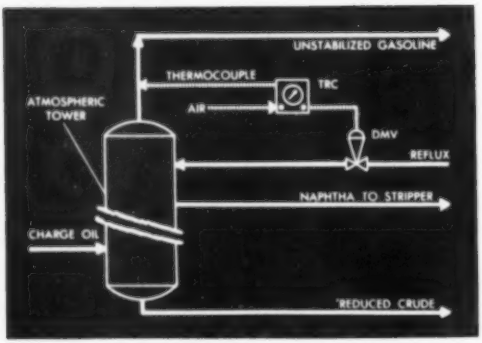
Without RSC-V, one additional operator would be required full time on the main tower structure to control manually the rate of product withdrawal. Elimination of one operator comprises principal basis for economic justification of RSC-V.



2—Utility Saving

Fuel costs on a crude still comprise about 25% of total operating cost. Reductions in fuel consumption, therefore, can effect appreciable savings. Many instruments in use today conserve fuel either through control action or as monitors for measuring combustion efficiency. For this application, a steam-fuel oil differential pressure regulator on the fuel oil system of the tube still atmospheric furnace is used. Proper atomization is insured by maintaining a differential pressure for oil and steam of about 20 psi.

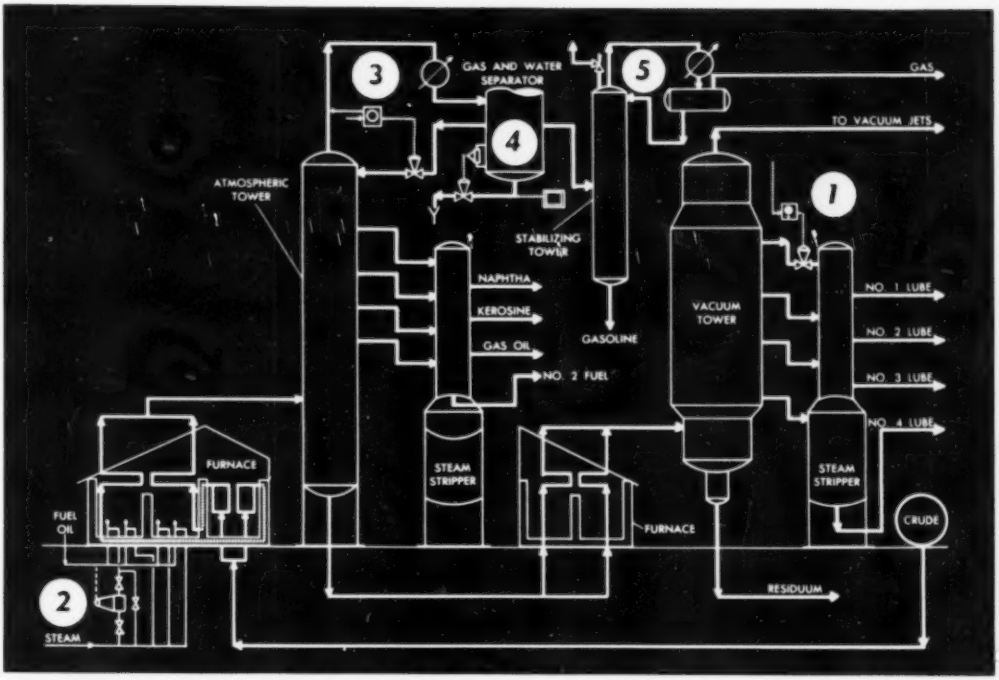
Proper fuel atomization minimizes consumption because it: promotes complete combustion with maximum heat recovery; reduces tube fouling, maintaining high heat transfer rates; lengthens equipment service life because of decreased firing severity requirements; reduces smoke.



3—Better Quality, Yield

A temperature recording controller, *TRC*, maintains the atmospheric towel top temperature within ±2° F., insuring production of a straight run gasoline quality and yield consistent with the overall refinery gasoline sary to maintain refinery octane balance.

The *TRC* maintains top temperature by increasing or decreasing the flow of reflux. The valve on the discharge line from the reflux pump is actuated by a temperature impulse originating at a point in the overhead vapor line. An increase in top temperature of 5° F. increases gasoline yield by about 10%; in this operation, lowering octane rating about two numbers. Correspondingly, a decrease in top temperature degrades gasoline to naphtha.

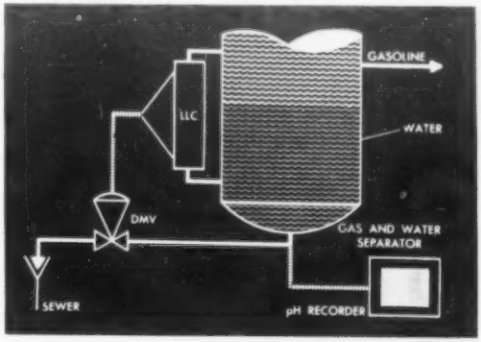


MANAGEMENT'S YARDSTICK FOR INSTRUMENT COSTS shown in the five locations on this crude still flow diagram

4—Maintenance Saving

Corrosive attack from diluted acids in the overhead system of the atmospheric tower is a constant maintenance problem. Aqueous ammonia is introduced in the vapor line to neutralize the acids, the injection rate being varied with changes in crude oil composition and salt content.

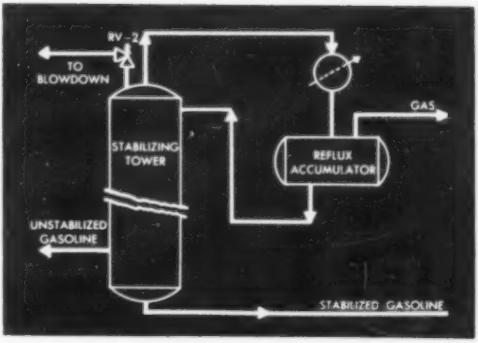
Corrosion is best combatted when the pH of the water effluent is kept close to 7.5. A pH recorder provides the operator with the necessary information for making prompt adjustments in the ammonia injection rate. Otherwise, the operator would have to wait for a laboratory analysis of the water, or use a not-too-accurate color indicator method. One is time-consuming and the other lacks precision. The pH recorder installation is justified on basis of increased service from the equipment and the attendant improved continuity of operation.

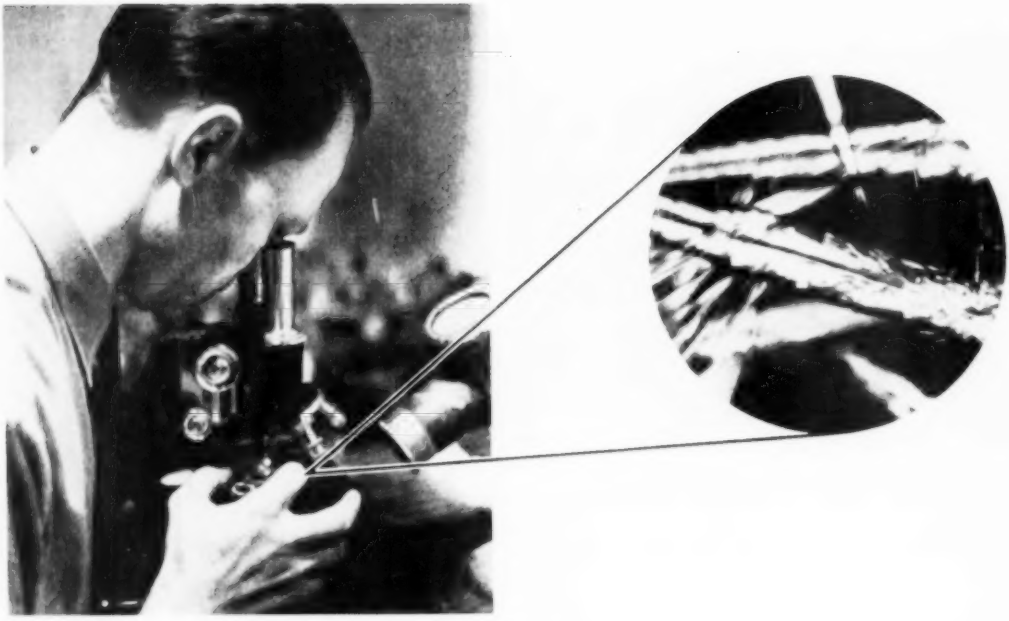


5—Safety

The straight run gasoline stabilizing tower operates under pressure. API and ASME codes require that pressure vessels be provided with relief valves. Relief valve *RV-2* at the top of the stabilizer is set to operate at a set pressure and to relieve to a blowdown pot. The design pressure of the tower is 150 psi.; its normal operating pressure is 85 psig. Valve *RV-2* is set to relieve hydrocarbon vapors at 135 psig.

The need for such a relieving device is evident. Possible injury to personnel and damage to equipment are avoided in the event excessive operating pressures develop. Like all safety or fire protection equipment, the savings are tremendous when measured in terms of life and property safeguarded.





MEETING PRODUCT QUALITY IN

Wax Crystallization

By H. A. LUND
Magnolia Petroleum Co.

PETROLEUM waxes must meet a great variety of specifications when used in such industries as packaging, candle, polish, electrical, rubber, leather, match, cosmetic and other manufacturing. Several grades of paraffin and microcrystalline waxes derived from refining crude oil are marked to satisfy the demands of the individual industries.

In general, the producers of wax can control the properties of their products by proper selection of stocks and operating variables during the wax deoiling operation. However, apparently the same types of stocks may show unexpected variations. Reasons for these occurrences are obscure and lead to numerous conjectures normally ascribed to an indeterminate characteristic of the wax at that particular time.

Experience has shown that the difficulties encountered in the deoiling

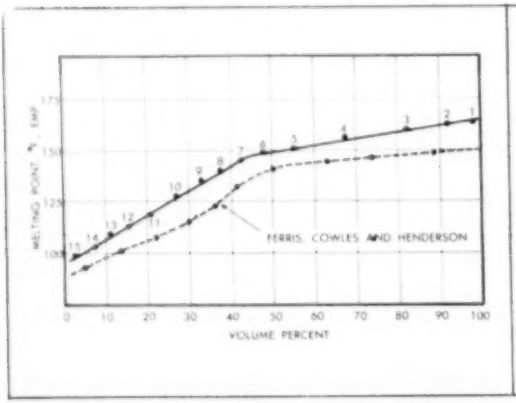


FIG. 1—Melting point distribution of narrow wax fraction

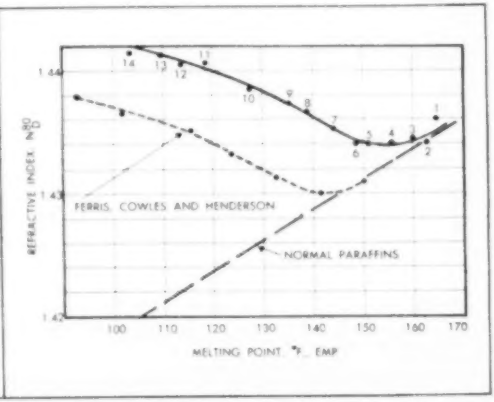
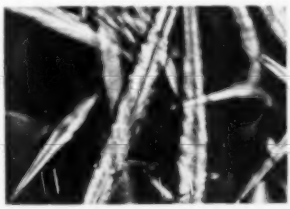
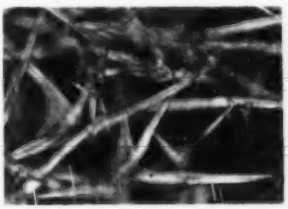


FIG. 2—Relation between refractive index and melting point of narrow wax fractions

Fraction No. 1



Fraction No. 8



Fraction No. 12

Fraction No. 14
450 Magnification
Partially polarized light

Fract.on No. 15
450 Magnification

Special 115.2 MP Plates

FIG. 3—Photomicrographs of waxes in their own melt. Magnification 100 unless otherwise noted.

process are reflected in the finished wax quality. Therefore, it seems reasonable to assume that finished waxes contain more than one type of crystal, each having its own general characteristics that may or may not be imparted to the whole wax mixture.

Many investigations have been published on crystallization of wax. Buchler and Graves[1] stated that petroleum waxes, when purified, contain normal paraffins and crystallize as plates. The waxes were found to contain a "soft wax" impurity which causes the plates to crystallize as needles. This theory was extended to the petrolatum.

Padget, Hefley and Henriksen[2] concluded that the type of crystal (plate or needle) formed depended to a large extent upon the cooling rate and oil content of the wax.

Ferris, Cowles and Henderson[3] [4] investigated narrow boiling range wax fractions and found the existence of three types of wax crystals. The plate type had the highest melting point, needles the lowest, and mal-crystals were intermediate between the two.

Of these investigators, Ferris, Cowles and Henderson were the only ones who studied purified fractions of approximately equal molecular weights. Most of their conclusions were based on crystal formation in solvents with little information presented on crystal structure of waxes solidifying from their own melt. The waxes utilized by industry are of the second type and consequently their properties are dependent upon the type of crystals formed from their own melt. The present investigation discusses characteristics of three types of crystals in the absence of solvent.

For the present investigation, a special narrow boiling range wax crude scale fraction from mixed Mid-Continent crude oil was deoiled at 0 F. using methyl ethyl ketone as a solvent. The resulting fraction possessed the following properties:

95% B.P. at 10 mm	800° F.
Melting Point, EMP	144.5° F.
Abraham Hardness at 100° F.	23.5
Tensile Strength (Thomas-Olsen)	70 lbs. /¼ sq. in.

This specially prepared wax was purified into 15 different fractions by repeated recrystallization in methyl ethyl ketone. Waxes melting from 99.4 F. to 164.6 F. were obtained and the physical properties of these fractions are shown in Table 1.

The comparison of these results with those obtained by Ferris, Cowles and Henderson is shown in Figs. 1 and 2. It will be noted that the shape of the curves agrees closely even though different boiling range and crude oil fractions were investigated.

Determination of the crystal structure of the fifteen fractions was done using a microscope with a camera attachment. Fractions 1 through 6 were found to have a plate structure. Fractions 7 through 12 were needles and 13 through 15 had a "micro" structure.

The last three fractions are referred to as "micro" due to their similarity to the crystal characteristics of petrolatum. Numerous but unsuccessful attempts were made to grow large size "micro" crystals. The crystals under high magnification resembled bacteria in appearance and not needles which are characterized by a median line or "hole in the middle". Photomicrographs of some of the fractions are shown in Fig. 3. Unless otherwise stated, the pictures were taken under 100 magnification employing polarized light.

The producers of wax developed certain specifications in addition to

Table 1—Properties of Narrow Wax Fractions

Fraction No.	Melting Point, EMP, °F.	Refractive Index n 80 D	% Yield	SUV 210° F.
1	164.6	1.4359	5.2	
2	162.4	1.4341	6.4	
3	159.7	1.4344	13.9	45.7
4	155.4	1.4339	14.4	
5	150.6	1.4340	9.9	
6	148.6	1.4340	5.3	
7	143.8	1.4352	5.9	
8	138.5	1.4385	3.3	
9	135.0	1.4372	5.4	44.9
10	127.1	1.4385	6.9	
11	118.7	1.4406	5.5	
12	113.4	1.4403	5.1	46.8
13	106.3	1.4411	2.4	
14	103.9	1.4413	5.2	46.2
15	99.4	1.4438	5.2	

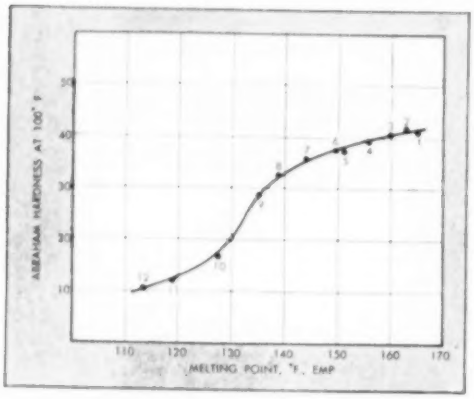


FIG. 4 — Abraham hardness of narrow wax fractions. (Note: 1-9, 10 sq. mm. plunger; 10-12, 100 sq. mm. plunger)

melting point and oil content that are pertinent to the end-use of the wax. The largest usage of fully refined wax is in the treating of paper for the manufacture of waxed cartons, bags, paper, etc. The milk carton manufacturer is primarily interested in a wax of good coating characteristics. The wax must also possess ductility to prevent chipping off the edges of a carton during handling.

Various laboratory tests are used by different wax producers to predict this property of the wax. Among those is the Tinius-Olsen tensile strength test. In this test a constant increasing load is applied to both ends of the wax specimen until breaks occur. The tensile strength of wax in pounds per ¼ square inch is read from the scale. A high tensile strength is desired by the milk carton industry. The tensile strengths are determined at 70°F. in a 50% humidity atmosphere. Table 2 is a summary of tensile strength of the wax fractions obtained in the present studies.

The data show that plate crystals exhibit low tensile strengths while the tensile strength of needles is high. The tensile strength of micro crystals was not determined.

The effect of blending on tensile strength of wax was shown as follows. Two parts of 109.3°M.P. micro wax were added to 8 parts of 155.4° M.P. plate wax. This resulted in raising the tensile strength of the plates from 0 to 98. Another blend of two parts 115.2°M.P. plates with eight parts of 159.7°M.P. plates resulted in a product having a tensile strength of 70. This relatively high tensile strength was obtained from a blend of a 28 and a 0 tensile strength wax of the above melting points. This shows that melting point distribution in the plate crystal type of wax is an important variable although the crystal type (plate, needle or micro) is a primary factor determining the tensile strength of the wax.

The wax paper manufacturer is primarily interested in a wax of high blocking temperature and high gloss. The blocking temperature of the wax must be sufficiently high to insure a smooth wax surface on the paper and to prevent blocking of rolled waxed paper during storage in hot weather. Hardness test indicates the blocking temperature and normally, the higher the hardness, the higher the blocking temperature. The Abraham Consistometer is used to test hardness of the wax. It measures the force required for the plunger to penetrate a wax sample at a specified rate.

The results of the hardness test on the various fractions of wax are shown in Fig. 4. The hardness varies directly with the melting point of the wax as can be seen from the curve. Blends of wax fractions used for hardness determinations are shown in Table 3.

The calculated blending value for hardness of the 115.2°M.P. plate and 118.7°M.P. needle waxes is approximately 0 and 6, respectively, while that of the 109.3°M.P. micro wax is about −20. The negative blending value of micro wax indicates that these crystals are undesirable for inclusion into hard waxes. Little, if any, correlation exists between the actual hardness and the blending hardness of the soft waxes.

High gloss is desired by waxed paper manufacturers because of sales-appeal for the paper processed. High gloss waxed paper is bright and has less of a tendency to "scuff" and collect dust. Four of the fractions were subjected to a simplified gloss test. Strips of paper were dipped in the molten wax and immediately chilled by plunging the

Table 2—Tensile Strengths of Narrow Wax Fractions

Fraction	M.P., EMP °F.	Crystal	Tinius-Olsen tens. strength
No. 2	109.7	Plate	0
No. 4	115.4	Plate	0
No. 7	143.4	Needle	60
No. 10	127.1	Needle	62
No. 12	114.4	Needle	stretched 280
Special*	115.2	Plate	28

* Specially prepared wax plates from a low boiling sludge fraction.

Table 3—Abraham Hardness of Special Wax Blends, at 100° F.

Fraction	Hardness
A. Special 115.2 MP. plates	15.8
B. No. 3, 130.7 MP. plates	40.4
2 parts A and 8 parts B	62.4
C. No. 13, 109.3 MP. micro	−10
D. No. 4, 155.4 MP. plates	40.0
2 parts C and 8 parts D	28.0
E. No. 11, 118.7 MP. needles	12.6
F. No. 1, 164.6 MP. plates	41.2
2 parts E and 8 parts F	34.2

Table 4—Gloss of Narrow Wax Fractions

Fraction	Crystal	Initial Gloss	Gloss Retention*
No. 4	Plate	Excellent	Excellent
No. 9	Needle	Excellent	Excellent
No. 12	Needle	Good	Good
No. 14	Micro	Fair	Fair

* Gloss at end of two weeks' storage in a 70° F., 50% humidity atmosphere. Gloss appeared to remain same over the two weeks.

Meet the Author

H. A. Lund has been supervisory process engineer since 1950 over ketone dewaxing and wax processing units in the technical department, Magnolia Petroleum Co., refining division, Beaumont, Texas. He has been associated with the company since 1946, coming there from Kansas State College, Manhattan, Kans., where he received a B.S. in Chemical Engineering.

Married, with two sons and a daughter (which takes care of much of my spare time), Mr. Lund took almost four years out of his college career for service with the Air Force, retiring from active duty in 1945 as a Captain.

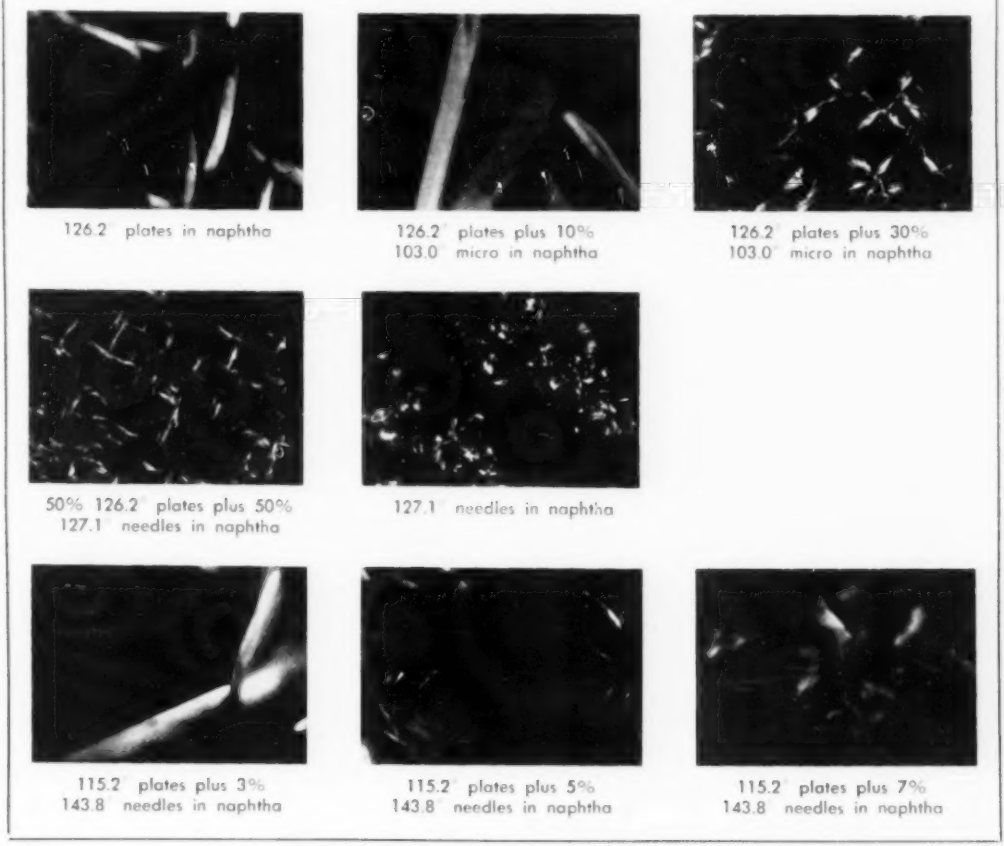

126.2° plates in naphtha
126.2° plates plus 10% 103.0° micro in naphtha
126.2° plates plus 30% 103.0° micro in naphtha
50% 126.2° plates plus 50% 127.1° needles in naphtha
127.1° needles in naphtha
115.2° plates plus 3% 143.8° needles in naphtha
115.2° plates plus 5% 143.8° needles in naphtha
115.2° plates plus 7% 143.8° needles in naphtha

FIG. 5—Photomicrographs of pressability studies. Magnification 100

strip into ice cold water. The strips were visually inspected for light reflection. The results of the gloss test are tabulated in Table 4.

As a control test on the quality of charge stock to the dewaxing plant, a laboratory "Pressability Test" was developed. This test consists of mixing the molten wax with an equal volume of a straight run naphtha and cooling the mixture to 50°F. The surface of the solid mixture is observed and its texture determined by feeling with the fingers.

Considerable experience is necessary on the part of the tester to grade the pressing quality of wax. This test is also used as a control test in factionation of lubricating oil distillates since the solvent dewaxing rate is materially affected by the wax quality. Experience has shown that waxes of poor pressability are quite difficult to deoil and the oils containing such waxes are difficult to dewax.

To investigate the factors involved, several pressability tests were conducted on wax blends. A special 126.2° M.P. plate wax (arising from the same source as 115.2° M.P. plate wax used in this work was found to possess excellent pressability characteristics; while a blend of equal volumes of 126.2° M.P. plate and 127.1° M.P. needle waxes had poor characteristics. These observations were verified on the laboratory testing equipment. The pressability of the 127.1° M.P. needle wax was poor. Progressive blends of 103.0° M.P. micro wax (Fraction No. 14) with 126.2° M.P. plate wax in naphtha are graded in Table 5, according to their pressability characteristics.

Pressability of blends of 143.8° M.P. needle wax (Fraction No. 7) with 115.2° M.P. plate wax is shown in Table 6.

Photomicrographs of the above waxes are shown in Fig. 5, demonstrating a distinct change in crystal structure with the change in pressability characteristics. Whether the pressability test is sufficiently accurate to differentiate between small changes in the crystal structure of the border line waxes is a matter of conjecture. Regardless of this, the effect of a low concentration of high melting point needles on low melting plates is quite apparent. The pressing characteristics of various wax mixtures seem to depend upon the concentration and melting point of

Table 5—Pressability of Blends of Plate and Micro Waxes

103 MP micro	126.2 MP plates	Pressability
10%	90%	Good
20%	80%	Good
30%	70%	Poor

Table 6—Pressability of Blends of Needle and Plate Waxes

143.8 MP needles	115.2 MP plates	Pressability
3%	97%	Good
5%	95%	Good
7%	93%	Poor

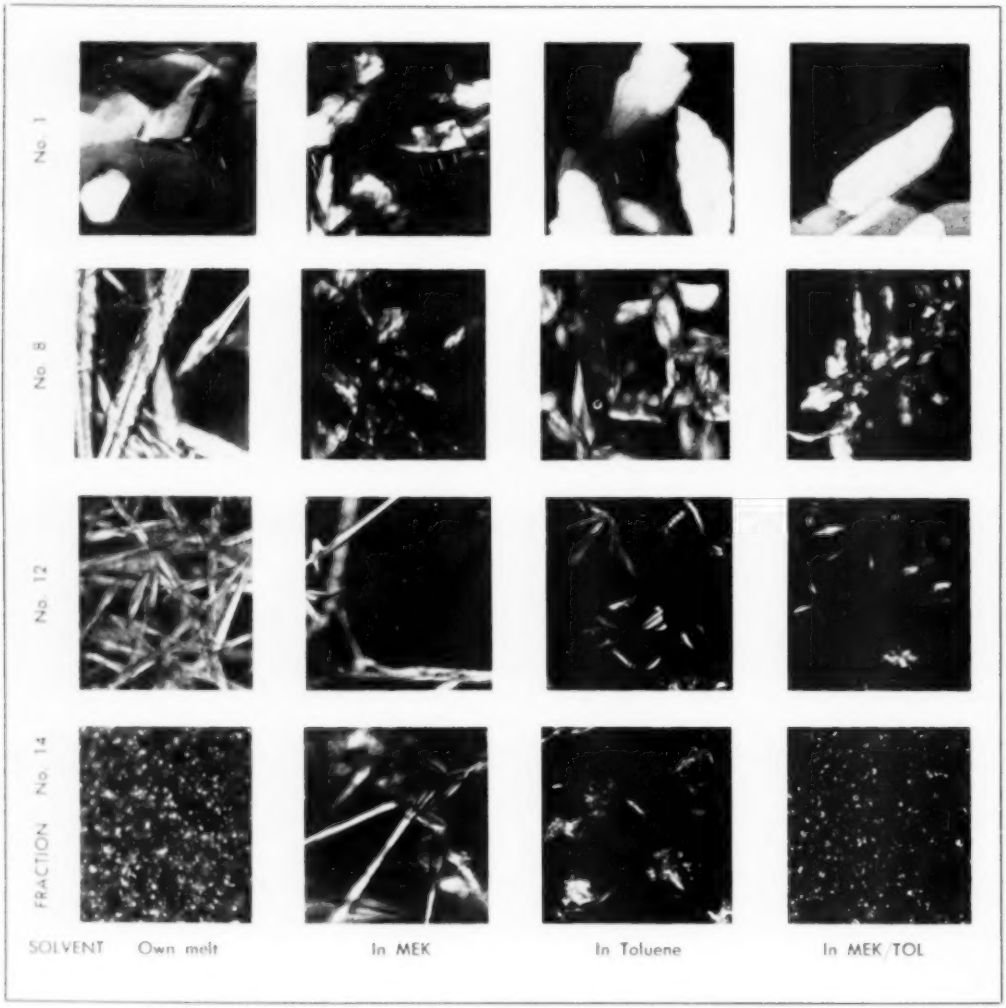


FIG. 6—Photomicrographs of wax fractions in several solvents. Magnification 100

the needle and micro crystals present in the plate type waxes.

During the pressability studies, it was noted that plate crystals crystallized as plates from naphtha but needle crystals changed to ill-defined plate crystals. This observation prompted study of the wax crystals in solvents used in refinery processes. Selected photomicrographs of the wax fractions are shown in Fig. 6 and tabulated in Table 7.

The term "mal-formed plates" commonly used covers a wide range in crystal appearance. All crystals are similar but vary in degree of malformity. The fact that these crystals appear to be "clustered" plates can be seen from the photomicrographs in Fig. 7. Referring to Fig. 6, it is interesting to note that needle crystals could be obtained in methyl ethyl ketone from the micro crystals and also from the 118.7° and

Table 7—Interpretation of Photomicrographs in Fig. 6

Fraction	MP	Crystal structure in			
		own melt	MEK	50-50 MEK Tol.	Naphtha
No. 1	104.6	Plates	Plates	Plates	Plates
No. 8	128.5	Needles	Mal-formed plates	Mal-formed plates	Mal-formed plates
No. 12	143.4	Needles	Needles	Mal-formed plates	Mal-formed plates
No. 14	193.0	Micro	Needles	Mal-formed plates	Micro

Table 8—Variations in Structure and Refractive Index of Hydrocarbons with Similar Melting Points

Hydrocarbon	M.P. °F.	Refr. Ind. n 80 D
$C_{31}H_{64}$ (normal)	165	1.420
$C_{30}H_{60}$ (iso)	167	1.424
$C_{30}H_{60}$ (naphthenic)	167	1.448
$C_{30}H_{38}$ (aromatic)	185	1.460

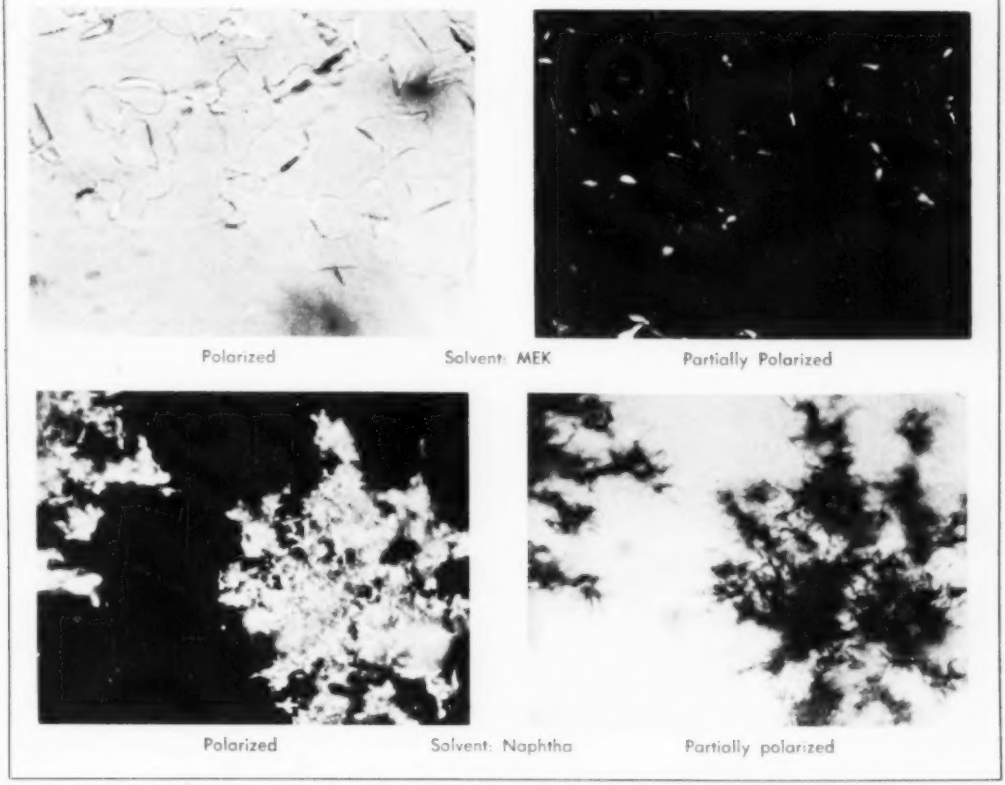


FIG. 7—Photomicrographs of mal-formed plates. Magnification 100. Fraction No. 10, 127.1 MP wax in solvent

113.4 M.P. needle fractions of undiluted waxes.

This phenomenon is presumably a function of the chemical structure of the waxes. Some insight into the chemical structure has been attempted. The index of refraction in combination with the melting point is often used as a measure of the general type of hydrocarbons present. The data shown in Table 8 illustrate the existence of chemically different hydrocarbon structures having the same melting point.

Referring to Fig. 2, it can be seen that the naphthenic hydrocarbon shown in Table 8 most nearly compares to the micro crystals obtained in this study. The chemical structure of needle crystals is apparently quite complicated and it is postulated that needles are predominantly isoparaffinic. The plate wax fractions closely approximate the structure expected from the normal paraffin hydrocarbons. A comparison of literature data (5) to this effect is shown in Table 9.

The following conclusions were made on the basis of this investigation.

1.) Petroleum waxes having the same boiling point form three types of crystals in their own melt; plates having the highest melting point, needles with the intermediate melting point and micro with the lowest melting point.

2.) The tensile strength of plate waxes is low while that of needles and micro waxes is high. This property is somewhat dependent upon melting point. Tensile strength may be improved by mixing waxes of the same crystal type but of different melting points.

3.) Hardness of wax is directly dependent upon melting point, and to a lesser extent, on crystal type. Micro crystals appear to have lower hardness blending properties than the melting point indicates.

4.) Pressability of plates is excellent while that of needles and micro crystals is poor. Mixtures of plates with either needle or micro crystals are pressable within certain limits.

5.) Crystallization properties of plates in various solvents are not influenced to the same extent as those of needle and micro crystals.

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(3) Ferris, Cowles and Henderson, *Ind. Eng. Chem.*, 23, 681 (1931).
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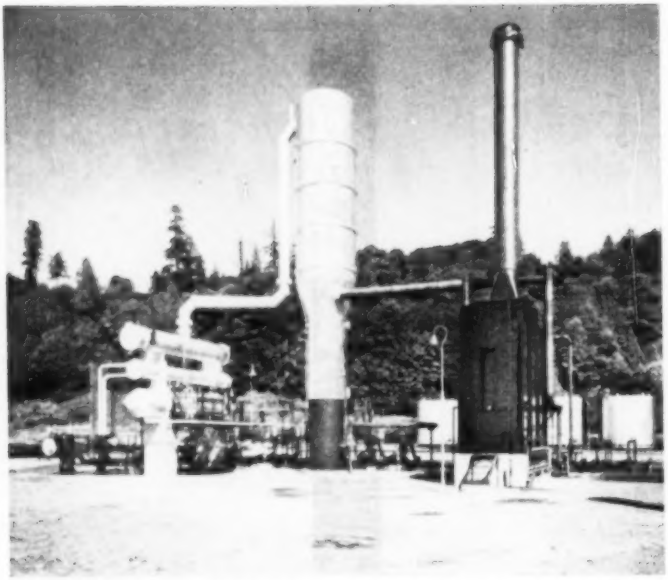
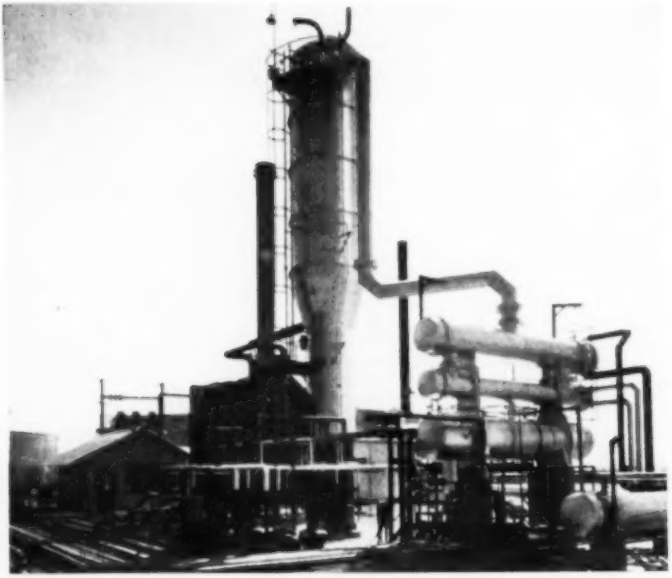
Table 9—Properties of Plate Wax Fractions Compared with Those of Normal Paraffins

Hydrocarbon	B.P. @ 10 mm.	M.P. °F.	Refr. Index, n 80 D
n-$C_{24}H_{50}$	565° F.	128	1.4326
Fraction No. 3		139.7	1.4344
n-$C_{25}H_{52}$	572° F.	135	1.432
Fraction No. 4		155.4	1.4339
n-$C_{26}H_{54}$	555° F.	150.5	1.431
Fraction No. 5		150.6	1.4340



NEW ASPHALT PLANT of Stancal Asphalt and Bitumuls Co. at Richmond Beach, Wash. Unit has charge capacity of 3,500 b/d, was built in 96 days

Modern Asphalt Refinery Can Be Neat and Trim



REAR VIEW of plant, showing pumps and piping manifold

THIS month's cover picture shows how neat and shipshape a modern asphalt plant can look in contrast to most of the miserable messes in operation. It is the 3,500 b/d asphalt refinery of Stancal Asphalt and Bitumuls Co., a subsidiary of Standard Oil Co. of Calif.

The plant is located at Richmond Beach, Wash., adjacent to Standard's large distributing plant at Point Wells. It is the first asphalt refinery in Western Washington, and was put into operation in June '50.

Although the plant has a design feed rate of 3,500 b/d, the major process units were engineered so that throughput can be increased to 4,500 b/d with only minor equipment additions.

Feed stock is a cut-back asphalt brought in by tanker from Standard's refinery at Richmond, Calif. From this the plant turns out eight grades of paving asphalt, plus some furnace oil. Total output of asphaltic materials is 150,000 tons annually.

Process flow in the plant follows standard procedure in asphalt manufacture, in which the feed stock is refined under a high vacuum. The operation of the main plant equipment, which is essentially a distillation tower, is at a maximum temperature of 650° F., with a 26-in. vacuum. Various grades of asphalt come off the main tower as side cuts.

Storage capacity at the new plant is in excess of 250,000 bbls. To facilitate handling of the product, all storage tanks and pipelines are steam heated. Shipment of product is in bulk lots by truck, tank car, barge, or tanker.

The refinery boasts one of the largest and most modern asphalt truck loading racks on the West Coast, on which two complete truck and trailer units can be loaded simultaneously.

The entire plant was built and turned over to Stancal for operation just 3 months and 5 days after start of construction—despite one of the wettest March and April seasons in Western Washington's history. It was so wet that portable shelters had to be provided for the welders so they could continue working.

There were a number of unusual problems encountered in designing the plant. Because of the 19-ft tides on Puget Sound special consideration had to be given the cooling water pumping system. And because of a high ground-water level, all critical underground concrete had to be waterproofed. Railroad tracks cut off the plant from the main highway, so a tank truck overpass had to be included.

Total cost of the plant was over $500,000. Design and engineering was handled by California Standard's Engineering Department, and construction by Parsons-Macco Co. as general contractor.

Sulfur from Industrial Gases

They contain more than enough to overcome shortages—and here's how they're handled

By PAUL ZURCHER
Consultant, Tulsa, Okla.

DEMAND for sulfur is going up so rapidly that the industry is incapable of meeting it. Apparent world consumption increased from 1,250,000 long tons in 1900 to 9,000,000 long tons in 1949. And it is estimated that last year the U. S. and the rest of the free world could have used about 1,400,000 tons more sulfur than was available and perhaps as much as 1,750,000 tons.[1]

Undoubtedly large amounts of sulfur are available from industrial gases. Lundy gives the following figures for sulfur released to the atmosphere by different industries of the U. S. in 1946:[2]

Source	Tons of Sulfur
Nonferrous smelters	5,729,000
Coal	25,000,000
Mineral Oil	5,000,000
Natural gas	1,000,000

Not counting coal, these materials contain more than 11 million tons of sulfur. If economics could justify the recovery of only 15% of this, present demands could be met.

By force of circumstances, the nonferrous metal industry has been making sulfuric acid and elemental sulfur from smelter gases for many years. An outstanding example is the Consolidated Smelting and Refining Co. of Canada Ltd., at Trail, B. C. In its report for 1946, this concern estimates its production of 100% sulfuric acid at 300,000-400,000 tons annually. The acid is used in processes and for the manufacture of nearly 500,000 tons of fertilizer. About 100 tons of elemental sulfur are made daily whenever there is sufficient sulfur dioxide available.

The petroleum industry has been giving more and more attention to such recovery operations itself. A survey completed late last year by PETROLEUM PROCESSING indicated that there were then eight plants in operation and recovering about 260,000 tons of elemental sulfur annually from the hydrogen sulfide in refinery and natural gases.[3] At the same time, 14 new plants were either under construction or planned, and two of the existing ones were being expanded, which together would increase output by nearly 345,000 tons annually.

Indications now are that the petroleum industry may be called on to add an additional 500,000 tons to its yearly output within the next few years. Defense Production Administration recently announced a goal for the annual production of 8,100,000 tons of sulfur and sulfur equivalents in the U. S. by 1955—an increase of 2,320,000 tons over our 1950 output of 6,080,000 tons.

The following review of the literature summarizes some of the more important developments in the recovery of sulfur from both petroleum and other industrial gases.

Removal of H_2S from Gases

Common practice in the gas industry is to separate the hydrogen sulfide from the sour gas by an absorption process and to convert the concentrated hydrogen sulfide into elemental sulfur. In special cases, where the hydrogen sulfide content of a gas is very low, the sulfur is produced without previous extraction of the contaminant.

Given favorable circumstances, the iron oxide process of the coal gas industry may be the most economical means of purifying a natural gas. A detailed description of a modern plant of this type is given by Connors and Miller.[4] The elemental sulfur formed upon regeneration of the spent mass may be leached out by carbon disulfide, or it may be used as a source for sulfuric acid. Only low-pressure gases can be handled in the iron oxide plants. A particular advantage is that the gases are freed of carbonyl sulfide, carbon disulfide and hydrocyanic acid. No carbon dioxide is taken up by the absorbent.

The iron oxide process is uneconomical when the gases are rich in hydrogen sulfide, as the frequent regeneration of the absorbent would be too expensive.

A transition stage from the iron oxide to a continuous regenerative process consists in suspending the iron oxide or hydrate in a solution of soda ash and countercurrently contacting the slurry with the gas.[5] The foul liquid coming from the absorber is agitated with air, the iron sesquisulfide is converted into oxide, and the sulfur floats to the surface and is skimmed off.

It does not require much imagination to replace the solid iron oxide in soda ash with a chemical compound in solution which reacts with hydrogen sulfide and releases it upon heating or blowing with air. In the Thylox process[6] the absorbent is a so-

Meet the Author

Dr. Paul Zurcher, author of this comprehensive survey of processes for recovering sulfur from industrial gases, has had a varied chemical background, much of it in the petroleum industry.

He was born and educated in Switzerland, studying chemical engineering at Federal Polytechnical School, Zurich, and receiving his PhD from the University of Zurich. Following that he worked in Italy, France, Bolivia and Colombia in the ceramics and metallurgical industries. In 1915 he came to the U. S., and held various positions in the chemical industry—both in research and management.

In 1927 he joined Continental Oil Co. as a research man, and was granted a number of patents on vapor-phase desulfurization and reforming. After the merger of Continental with the Marland Co. he became research technologist, specializing in dewaxing and the manufacture of lubricants.

He left Continental in 1946 and joined the University of Tulsa the following year as Assoc. Professor of Petroleum Refining. Just recently he resigned that position in order to devote all of his time to his consulting activities.

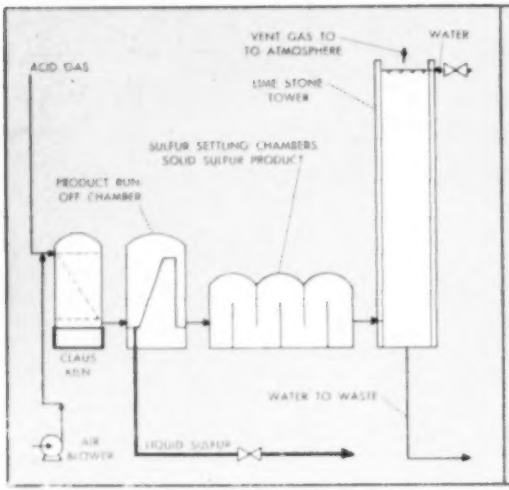


FIG. 1—Original Claus sulfur-recovery process

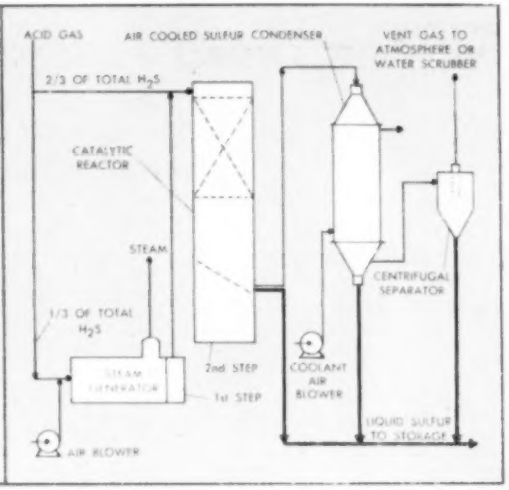


FIG. 2—Improved Claus process, as developed in Germany

lution of arsenious oxide in soda ash. In the regenerator, where the foul solution is aerated, the sulfur separates as a whitish-yellow scum and is filtered off as a paste consisting of 50% sulfur, the balance being moisture, traces of salts and minor impurities.

In the Seaboard process, the hydrogen sulfide is absorbed in soda ash solution and driven out by air-blowing, no oxidation taking place.[7,8] The hydrogen sulfide is diluted with so much air that its conversion into sulfur is uneconomical.

Requirement of steam for regeneration of the foul solution is greatly reduced in the Phenolate process[9] by addition of phenol to the caustic soda solution which serves as absorbent. The acidity of phenol at room temperature is lower than that of hydrogen sulfide, while at elevated temperatures it is higher. Consequently, the hydrogen sulfide is quickly removed by heating of the phenolate solution.

The Alkacel process applies a similar principle, with the difference that the weakly acid compound varies with the requirements of removing either hydrogen sulfide or carbon dioxide.[10]

Tripotassium phosphate is the absorbent of the Shell Phosphate process.[11,12,13] No carbon dioxide is removed from the gas. The great advantage claimed for this process is that hot gases can be processed because of the low equilibrium pressure of the hydrogen sulfide over the phosphate solution at 200° F.

The Girbotol process differs from the others in that its absorbents are organic compounds.[14] Moisture content of a gas can be reduced to any desired level by the addition of glycol to the ethanolamines.[15] Gases can also be dehydrated without desulfurizing.[16] The advantages of methyldiethanolamine as an absorbent have been pointed out by several investigators.[17,18,19] Hydrogen sulfide can be removed, the carbon dioxide remaining in the gas. If glycol is added to the methyldiethanolamine, the purified gas may contain as little as 0.01 grain of hydrogen sulfide in 100 cu. ft. Simultaneous removal of hydrogen sulfide and carbon dioxide is discussed by Chapin.[20] Adaptation of the composition of the absorber liquid to varying conditions, and for prevention of corrosion is discussed by Connors and Miller.[21]

Conversion to Sulfur

Two British technologists were the pioneers in the recovery of elemental sulfur from waste materials. Chance[22] treated calcium sulfide, a by-product of the Leblanc soda ash process, with carbon dioxide from the lime kilns of the soda plant and obtained hydrogen sulfide and calcium carbonate. Claus[23] oxidized the hydrogen sulfide to elemental sulfur according to the reaction

$$H_2S + \tfrac{1}{2}O_2 = H_2O + S$$

Fig. 1 shows a flow diagram of the process. The hydrogen sulfide was mixed with air and passed through a reaction vessel filled with bog iron ore at a "dull red heat". At the prevailing conditions the yield of elemental sulfur was 85% of the theoretical. The balance in the exit gas consisted of hydrogen sulfide and sulfur dioxide. Much of the elemental sulfur was collected in liquid form at the outlet of the "kiln", and the mist of sulfur suspended in the gas settled out in a long dust chamber. The sulfur dioxide remaining in the gas was absorbed in a water scrubber, and the hydrogen sulfide was removed in an iron oxide box. By adjusting the kiln outlet temperature to about 500 deg. F., it was possible to hold the reaction more or less under control. Increase of temperature was countered by reducing the gas flow and by changing the ratio of the air, or by recirculating a part of the stack gas. Thus the oxidation of sulfur already formed to sulfur dioxide was avoided.

The kiln was large for the purpose of dissipating the heat of reaction. A Claus unit produced about fifteen long tons of sulfur a week; the slow dissipation of heat did not permit a flow of gas faster than 2-3 cu. ft. per cu. ft. of contact mars per hour.

Haehn[24] described the improvements made on the process in Germany. Claus had tried to abstract heat from the kiln by means of cooling pipes but had met with little success. The Germans divided the process into two steps, as shown in Fig. 2. The reaction evolving the greatest amount of heat is carried out in a waste-heat boiler. One third of the hydrogen sulfide is mixed with sufficient air to oxidize the hydrogen sulfide to sulfur dioxide as follows:

$$H_2S + 1\tfrac{1}{2}O_2 = SO_2 + H_2O$$

Heat is liberated in this step at the rate of 124-138 kgcal. per mol. The products of combustion from the boiler are at about 900° F. and are mixed with the remaining two thirds of the hydrogen sulfide and passed through the catalytic reactor at 700-750° F. where the hydrogen sulfide is oxidized and the sulfur dioxide is reduced to elemental sulfur, with the liberation of heat at the rate of 21-35 kgcal. per mol.

$$SO_2 + 2H_2S = 3S + 2H_2O$$

In the old Claus process, the whole heat of reaction of 53 kgcal. released by one mol. of hydrogen sulfide was removed by radiation, while in the improved version, 41-46 kgcal. are absorbed in the waste-heat boiler and only 7-12 kgcal. are liberated in the actual contact process. This change in operation increased the throughput per hour to 200-300 cu. ft. per cu. ft. of catalyst mass. Yields of 92-94% are obtained. Bachr suggested that the sulfur remaining in the exit gas might be recovered by passing the gas into water or a salt solution. In the U. S., it is customary to install an additional contactor for a recovery of 99% of the sulfur.

According to Bachr,[19] 150 million cu. ft. of gas were purified daily in Germany, yielding one million cu. ft. of hydrogen sulfide. The raw material was water gas for synthesis and waste-gas from hydrogenation plants. At the time of Bachr's report (1958), 12 desulfurizing plants were under construction in Germany. Annual production of sulfur from gas was about 30,000 metric tons.

In a later modification of the Claus process, the air required for the conversion of the hydrogen sulfide is added to the whole of the gas, and the mixture flows through the waste-heat boiler in which 60-65% of the hydrogen sulfide is converted into sulfur. The partially cooled flue gas from the boiler is passed into the catalytic reactor for final conversion of the balance of the hydrogen sulfide.

When the hydrogen sulfide content of the gas is insufficient to support combustion under a steam boiler, the gas, or the air to be admixed, or both, are preheated to bring the reactants to the operating temperature. This method can be applied to the desulfurization of natural gas without the intermediate step of extracting the hydrogen sulfide. The heating value of the gas will be reduced by the introduction of the nitrogen in the added air.

Commercial Plants

All modern commercial processes for the conversion of hydrogen sulfide into elemental sulfur are based on the reactions first applied by Claus.[22]

McKamie (Arkansas) Field — The development of the sulfur recovery from hydrogen sulfide has been recorded in literature.[23] A detailed description of the two commercial plants in this field is given by Sawyer and others.[24] The unit at McKamie, of a design capacity of 110 long tons daily, began operation in Oct., 1944; the other, at Magnolia, Arkansas, was started in 1946, with a design capacity of 60 tons daily. Estimated production of the two plants in 1950 was 50,000 long tons.

The charge gas coming from the Girbotol plant at McKamie contains 53-54% hydrogen sulfide, 35% carbon dioxide, and 1-4% hydrocarbons. Fig. 3 is a flow sheet of the Mathieson process in use at the two plants. The gas at about 5 psig. pressure and at 110-150° F. enters the knockout drum, in which entrained water is separated. Sufficient air is then added to the gas for oxidation of the hydrogen sulfide to sulfur and for the combustion of the hydrocarbons. The quantity of air added is easily adjusted by hand control. Partial conversion to sulfur is obtained in a combustion furnace, which is a horizontal drum, 9 ft. in diameter and 22 ft. in length and divided into three independent sections.

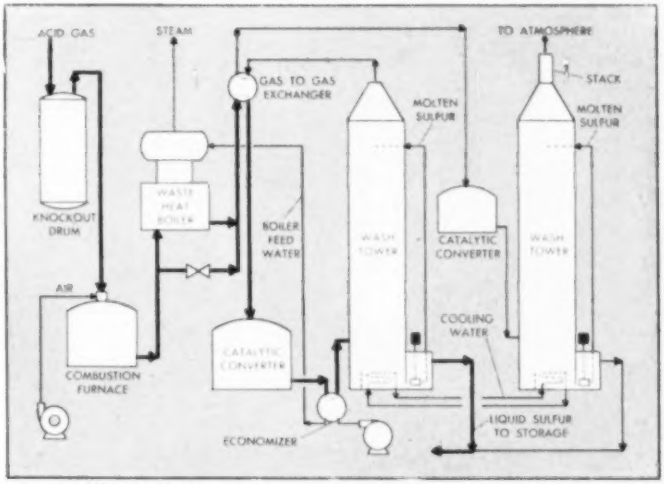


FIG. 3. Mathieson Chemical Corp.'s sulfur recovery process.

When the plant starts up, the furnace is brought to 1000° F. The gas mixture is admitted and heated by indirect heat exchange in the furnace with the reaction products. In order to hold the reaction static, the combustion space is filled with firebrick. If this is not done, the reaction front moves forward into the line, and conversion ceases. In the partial transformation, the heat produced per hour per cu. ft. of space is 15,000 Btu.

Before entering the converters for the completion of the reaction, the gases are cooled in a waste-heat boiler which yields 5000 lbs. of saturated steam of 300 psig. pressure for each ton of sulfur made. At 750° F., the gas flows downward through granulated active bauxite. The depth of the catalyst layer varies between 9 and 22 in., depending on operating conditions (gas velocity, water content, etc.). There is no deterioration of the catalyst, but the accumulation of carbonaceous matter originating from the hydrocarbons present in the gas gradually increases the resistance to the flow of the gas. For this reason, the catalyst is changed every few years.

The sulfur formed in the furnace does not disturb the reaction in the first converter, but it must be removed before the gas enters the second converter in order to lower the dew point of the gas emerging from the latter.

After the gas from the first converter has been cooled in a feedwater economizer, it enters the first wash tower or sulfur tower, in which it moves upward against a downflowing stream of molten sulfur at 250-275° F. The sulfur tower is 8 ft. square, of unlined mild steel and packed with staggered horizontal angle irons.

All the elemental sulfur carried along with the gas is picked up and leaves the tower at the bottom with the wash stream. The gas coming from the tower is reheated to 450° F. and passes through the second converter and the final sulfur tower.

In the furnace some side reactions occur on account of the presence of hydrocarbons in the gas, the most important being the formation of carbonyl sulfide. An example of the composition of the gas leaving the furnace is:

H_2S	0 vol. %
SO_2	6.42 vol. %
COS	5.82 vol. %
CS_2	0.24 vol. %
S_2	3.73 vol. %
Water	24.26 vol. %
N	Balance

The conversion of hydrogen sulfide into elemental sulfur decreases with increasing temperature; at 932° F. it is given as 73.1%; at 1200° F. it is 70.0%. This is explained by the assumption that as soon as elemental sulfur is formed while the tempera-

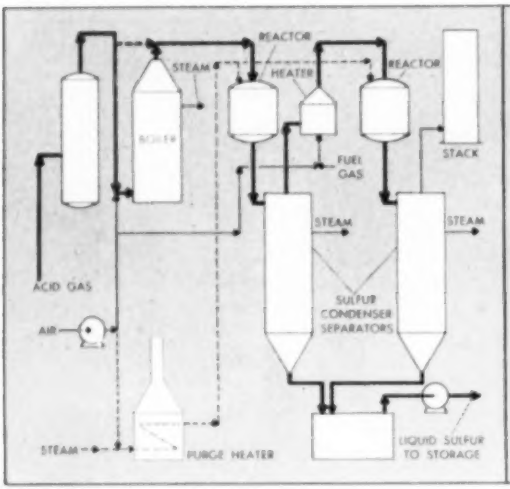


FIG. 4 Stanolind's Elk Basin sulfur-recovery plant

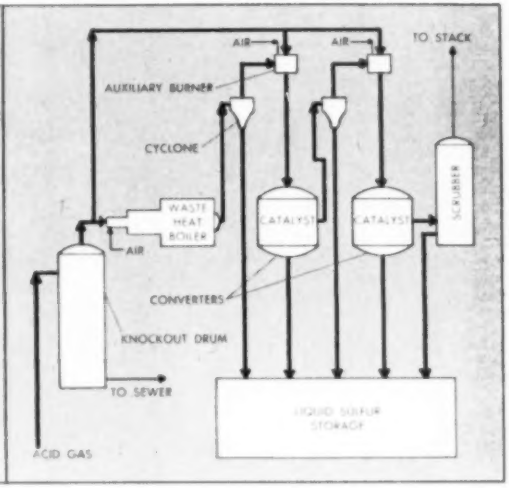


FIG. 5 Hancock Chemical Co. sulfur recovery plant

ture is rising, oxidation into sulfur dioxide takes place. For this reason two reactors are required at McKamie. In the first, the conversion of carbonyl sulfide to hydrogen sulfide takes place at 750° F.

$$COS + H_2O \rightarrow H_2S + CO_2$$

In the second converter, the hydrogen sulfide reacts with the sulfur dioxide to form elemental sulfur at 450-500° F.

Total recovery of sulfur is 92-97% of theory. The stack gases are free of hydrogen sulfide and contain a maximum of 0.5% sulfur dioxide.

Mild steel is a satisfactory material of construction. It is covered with fireclay wherever high temperatures prevail. Heat exchangers are made of stainless steel. In six years of operation, there has been no appreciable corrosion in the process equipment.

The sulfur is made into sulfuric acid at an acid plant in Louisiana. For delivery the molten sulfur is loaded into two 15-ton trailers at 280° F. Temperature drop is 1° F. in five minutes. For the case of unexpected delays, the trucks are equipped with steam coils.[24]

Elk Basin (Wyoming) Field — In the Elk Basin, on the border of Wyoming and Montana, the Stanolind Oil & Gas Co. operates a repressuring plant and processes 12,000,000 cu. ft. per day of casinghead gas containing 18.5% hydrogen sulfide and 6.0% carbon dioxide. Hydrogen sulfide is separated from the gas in a Girbotol plant and is converted into elemental sulfur in a unit designed to produce 74 tons a day.[24]

The flow-sheet of the sulfur plant, Fig. 4, is based on a modification of the Claus process. The gas from the Girbotol plant contains 75% hydrogen sulfide and 25% carbon dioxide. As in the Mathieson plants, the entrained water is first separated. One third of the gas is diverted from the main stream and burned with sufficient air to convert the hydrogen sulfide into sulfur dioxide. This is accomplished in a boiler of special design which removes the heat of reaction and produces saturated steam of 200 psig. pressure. Working in this manner dispenses with the furnace required by other modifications of the Claus process.

The combustion product from the boiler joins the main stream of the gas, entering the first converter at 450° F. and leaving it at 750° F. The increase in temperature is due to the heat released by the reaction of hydrogen sulfide with sulfur dioxide. Sulfur formed in the converter is removed by cooling the gas to 300° F. and sending it through a condenser-separator in which water is the coolant instead of molten sulfur as in the Mathieson process. Saturated steam of 35 psig. pressure is a by-product of this step. In order to recover the sulfur remaining in the form of hydrogen sulfide and sulfur dioxide, the gas is heated to 450° F., flows through a second converter and, after being cooled, to a second condenser-separator, whereupon it is released to the atmosphere.

The converters are cylindrical vessels about 16 ft. in diameter with catalyst beds 6 ft. in height. At a design space velocity of 250 cu. ft. per cu. ft. of space per hour, the gas flows downward through the 4-8 mesh bauxite catalyst. To minimize corrosion, 1080 stainless steel is provided in the outlet piping of the converters and in the inlets of the condenser-evaporators.

In the Elk Basin plant, the carbonaceous matter deposited on the catalyst is burned from time to time by an auxiliary heater.

The molten sulfur is handled in the orthodox fashion in use at the large sulfur mining plants in Louisiana and Texas.

On comparing the units of the Mathieson Chemical Corp. with that at Elk Basin, one may gain the impression that the Mathieson plants are more refined. The gas released to the atmosphere at the McKamie plant contains no hydrogen sulfide and a maximum of 0.5% sulfur dioxide. In the Elk Basin plant, the exit gas contains as much as 1% hydrogen sulfide. However, the Elk Basin plant is simpler in design, particularly because the fairly complicated furnace is not required. However, one must consider that the report on the McKamie unit was written after six years of operation. The rather short article on the Elk Basin plant lacks in details and was published a few weeks after operation had been started.

Hancock Chemical Co. Plant — The sulfur recovery plant of the Hancock Chemical Co. near Watson, Calif. is interesting from two view points.[25] It collects the hydrogen sulfide from the waste gases of several refineries in the form of foul diethanolamine solution, converts it into sulfur and returns the diethanolamine to the refineries under sufficient pressure to complete the cycle. The gases of relatively low hydrogen sulfide concentration require a specially adapted plant.

Design of the equipment was based on the experience gathered at the refinery of the Anglo-Iranian Oil Co. at

Abadan. The heat released by the conversion of hydrogen sulfide into sulfur is insufficient to sustain the reaction; as a consequence, auxiliary heaters are provided to bring the gas-air mixture up to the required temperature.

In a burner, one third of the hydrogen sulfide in the gas is converted into sulfur dioxide. Excess heat is removed in a waste-heat boiler. A part of the sulfur is condensed and removed. Sulfur remaining in the gas in the form of mist is collected in a cyclone. The gas flows then to a chamber with an auxiliary burner and thence to a converter filled with catalyst, followed by another cyclone, a second auxiliary burner, a converter and a final scrubber, as shown in Fig. 5.

The sulfur is 99.8% pure. Original design capacity of the Hancock plant was 50 tons a day.

Other Plants—Less information is available on the unit at Westville, N. J., of the Freeport Sulfur Co.[(18)] Built by Girdler Corp., the plant desulfurizes gases of the Eagle Point refinery of The Texas Co., which processes 40,000 bbl. a day of high-sulfur crude oils from South America and the Middle East. Design capacity is 40-50 tons a day. One third of the hydrogen sulfide is oxidized to sulfur dioxide and mixed with the other two thirds of the gas from the Girbotol unit. No details of the equipment are available.

A plant built for Texas Gulf Sulphur Co. and Pure Oil Co. at Worland, Wyo., went into operation in April 1950. Well gas of 30% hydrogen sulfide content is purified by monoethanolamine and the foul gas from the Girbotol unit is converted into 300 tons of sulfur daily. No details are given.[(19)]

New Process

A departure from the Claus process is the recently announced method of the Jefferson Lake Sulfur Co.[(20)] The sulfur dioxide required for the reaction is not obtained by oxidizing one third of the hydrogen sulfide contained in the gas, but by burning some of the sulfur already made and adding the product to the gas. No water vapors are formed.

A special catalyst permits operation at such low temperature that the hydrocarbons present in the gas go through the process without being affected. Apparently more reactors are necessary than in the Claus process. Mentioned are a minimum of three, two of which are on stream in series, the third being regenerated. Time switching is automatic.

Natural gases containing from 1% to more than 30% hydrogen sulfide can be desulfurized. If the claims are correct, then it may be possible to desulfurize the gases directly without the necessity of first separating the hydrogen sulfide.

Another advantage claimed for the new process is that the sulfur from the unit is converted into flakes in a special machine and can be shipped as soon as made without the necessity of solidifying and breaking down large blocks of sulfur.

The process is reportedly ready for full-scale operation, although no plans for a commercial plant have been announced.

Sulfur from Sulfur Dioxide

Reduction of sulfur dioxide is of interest to refiners who must dispose of acid sludge.[(21)] Upon heating the sludge in absence of air, coke and a gas containing sulfur dioxide are formed. It is suggested to make sulfur from this gas instead of purifying it by complex methods for the preparation of sulfuric acid.

Experience gathered in metallurgical smelters is available. The Trail smelter of the Consolidated Smelting and Refining Co. of Canada, Ltd., has three units of a total design capacity of 150 long tons of sulfur a day. They are operated whenever there is insufficient demand for acid.[(22)] Pure sulfur dioxide is made from roaster gases by absorption in ammonium sulfite and decomposition by heating of the disulfite formed.

$$2NH_4HSO_3 \rightarrow (NH_4)_2SO_3 + SO_2 + H_2O$$

The hot sulfite solution is cooled and used again indefinitely. Reduction of the sulfur dioxide by means of incandescent coke is effected in producers which are charged with coke from hoppers through slide valves. The ash is discharged by a rotating grate provided with a water seal. Concentrated sulfur dioxide enters at the bottom. A little oxygen is added in order to facilitate the reaction. The treated gas leaving near the top of the producer consists mainly of carbonyl sulfide, carbon monoxide, and some carbon dioxide. The coke dust carried along by the gas is precipitated in the usual manner. A part of the sulfur dioxide by-passes the producer and joins the treated gas, the purpose being to react the carbonyl sulfide with the sulfur dioxide to form elemental sulfur.

From here on the equipment is similar to that of the Claus process. Additional apparatus consists of a tube and wire-type treater which holds back the mist of liquid sulfur in the tail gas, and a steam-heated Shriver press for filtering out fine carbon particles. The sulfur is 99.99% pure.

The American Smelting and Refining Co. has developed a different method of reducing the sulfur dioxide,[(23)] using natural gas, which reacts as follows:

$$2SO_2 + CH_4 \rightarrow 2H_2O + CO_2 + S_2$$

Like in the other processes, the chief reaction product of the primary combustion is carbonyl sulfide. At 45-in. water pressure it is reduced to sulfur in a converter filled with bauxite. The temperature is held somewhat higher than usual (792-842° F.). All sulfur formed is separated from the gas by cooling to 260° F. and sending it through a Cottrell precipitator. The gas is brought to 410° F. and goes through a second converter filled with activated alumina; the sulfur is precipitated in a second Cottrell after cooling.

A continuous automatic analyzer controls the ratio of sulfur dioxide and natural gas. In the pilot plant of five ton capacity the sulfur recovery was 85% of the theoretical; it had a one-stage conversion. It is expected that a full-scale plant with two converters will recover 95% of the sulfur.

In this process the crucial economic factor is the natural gas. A smelter gas containing 6% sulfur dioxide by volume requires 9.5% by volume of natural gas. It is claimed that gases containing 5 to 8% sulfur dioxide can be economically treated with natural gas of moderate cost. Eight per cent sulfur dioxide is about the upper limit. If concentration is higher, there is not sufficient oxygen present to sustain high-temperature combustion. Plans for a plant of a capacity of 35 tons per day were not realized on account of insufficient gas supply during the cold season.

Economic Considerations

The few statements found in the literature about the cost of building a sulfur recovery plant differ little and seem to agree with the calculation of Wilcoxon,[(24)] according to which the outlay for one ton annual capacity is $7. Weber[(25)] cites $5000-7000 per ton of daily capacity, and Graff[(23)] names $350,000 for a unit of 50 tons daily capacity. Building costs have increased considerably since these estimates were made in 1949.

Graff[(23)] and Weber[(22)] report the cost of a ton of sulfur from hydrogen sulfide to be $6, including all charges. A very detailed estimate of the cost of removing hydrogen sulfide from synthesis gas and its conversion into sulfur was prepared by the Bureau of Mines.[(26)]

(Recent and up-to-date sulfur recovery cost figures are presented on the next two pages.—Ed.)

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How Much It Will Cost You To Recover Sulfur from H_2S

By J. L. PARKER*
The Girdler Corp., Tulsa

THE manufacture of elemental sulfur from hydrogen sulfide has been known for about 80 years. However, only recently have sulfur recovery processes been considered and applied so widely. The reasons for this upsurge are logical.

First, hydrogen sulfide is being produced in increasing quantities through refining sour crudes and processing increased quantities of sour gas, and the disposal of H_2S is dangerous and a nuisance. Hydrogen sulfide is almost as toxic as hydrogen cyanide. Many, familiar with the odor, minimize its danger, not realizing that in fatal concentrations it paralyzes the olefactory nerves and one is not aware of the danger until it is too late. We all know of casulties resulting from hydrogen sulfide, and its deadliness cannot be over emphasized.

The disposal of H_2S by complete combustion to SO_2 presents problems. Although SO_2 is poisonous, it is not as dangerous as H_2S due to its irritant nature, causing one to leave the vicinity before a toxic concentration is reached. However, SO_2 is a nuisance forming smog in some localities and resulting in crop damage in others. The prime example of the latter was the wide spread damage caused by the smelter at Trail, British Columbia, resulting in an international tribunal with large awards to the owners of the damaged crops.

In addition to the danger and nuisance value we have the improved economic status of sulfur, which causes all of us to reconsider before wasting a sulfur-containing compound. When modern sulfur recovery processes were first being tried in this country the price of sulfur was $13 per long ton and the supply from the mines in southern Louisiana and Texas was apparently more than adequate and inexhaustible. The price of sulfur has increased to $22 per long ton and under present conditions will increase further.

From what one can read our supply of mined sulfur is adequate for our present domestic consumption. However, since we have undertaken to supply the world with our natural resources and the world is anxious to receive them because of the lower cost (European sulfur costing from $75 to $100 per ton), a shortage has resulted.

Even were we to keep the mine sulfur for our own uses, sulfur recovery from H_2S would continue to expand. The low cost mines are being exhausted and are being replaced by high cost operations, such as the recently publicized Freeport mine and the Chemical Construction process for processing low grade ores. Gradually we are approaching the point where sulfur can be produced from pyrites, our most plentiful source, but this production will require a sale price of sulfur of approximately $30 per ton. With these processes recovery of sulfur from H_2S will be competitive down to very small plants.

Since the recovery of sulfur has so many advantages, the question arises as to why one should not go directly to sulfuric acid, the product in which we are primarily most interested. This is entirely feasible as long as there is a sulfuric acid plant on hand, such as the one at the Cities Service Lake Charles plant. However, without an acid plant available, it is more economical and feasible to recover the sulfur and, if sufficient quantity of sulfur is produced and a market or use for the sulfuric acid is at hand, to build a separate acid plant.

The manufacture of sulfuric acid directly from H_2S rather than from sulfur involves a greater cost due to greater volumes of gas to be handled, especially when CO_2 and hydrocarbons are present. In addition, unlike burning sulfur, the combustion of H_2S produces water. The resulting gases must be cooled, dried and reheated for the production of sulfur trioxide. Corrosion in this cooling and drying equipment is severe.

Considering the economics of sulfur recovery plants, we will proceed on the following basis. First, if a Girbotol plant is required for the single purpose of extracting hydrogen sulfide for conversion into elemental sulfur, a 50-ton sulfur plant is probably the minimum size plant that should be considered. The reason for this is that the Girbotol plant will represent approximately 50% of the total investment.

However, in most cases involving sulfur tonnages of less than 50 tons, a Girbotol plant is required or could be used to advantage to meet various petroleum product specifications or to avoid corrosion. With the Girbotol plant investment not being charged against the sulfur plant investment, it is well established that a produc-

* This article is condensed from the paper "Sulfur from Hydrogen Sulfide," presented by the author at the regional meeting of the Western Petroleum Refiners Assn., in Beaumont, Texas, Feb. 5. A portion of the original paper dealing with the history of sulfur recovery processes has been omitted here, in view of the preceding discussion of this phase of the subject.

tion of 20 tons of sulfur per day is an economically feasible venture at present prices. But in many refineries there is less sulfur available, and the question arises as to what is the minimum size plant which is economical.

In investigating the costs of these smaller plants, 15 tons and under, the investment costs are based on a single stage plant recovering 80-85% of the available sulfur. This plant is selected because a two stage plant will cost approximately 30% more and, as will be noted, the justification of this increased investment cost is dubious.

The plant investment and operating costs are based on the following:

Labor—One operator at $2 per hour for 365 days per year. A plant can be designed so that it will require the attention of only a part time operator. However, to be very conservative, we have figured cases for a full time operator and a half time operator. The sulfur is considered for these cases to be stored and shipped as a liquid to avoid additional labor costs. Provisions for storage of liquid sulfur have been provided in the cost estimates.

Steam—The plant will produce sufficient steam (approximately 2 lbs. per lb. of sulfur) to operate the air blower, the exhaust steam being used for jacketing, etc. No facilities have been included for condensing the low pressure steam as these facilities are usually present in a refinery.

Treated Boiler Feed Water—No facilities have been included for treating this water as again it is usually provided. However, pumps have been provided. Approximately 0.6 gpm of water per daily ton of sulfur is required, and a value of 50c per 1000 gals. has been used as the cost of this water.

Electricity—Since the major power load is the air blower, this is steam driven. Electricity is used in pumping sulfur either for storage or condensation of vapor sulfur. We have selected the maximum, which will amount to 0.55 KWH hr. per ton of sulfur produced. A value of 1c per KWH is used.

Maintenance—Since we are dealing with corrosive gases, the maintenance will vary. We are using a value of 25% of the equipment cost per year, which we believe is very conservative.

Value of H$_2$S—We are assuming that the hydrogen sulfide is owned by the company concerned. It is probably being burned as fuel. Figuring a heating value of 500 BTU, we are using a value of 7½c per 1000 SCF.

Interest on Money Investment—Again to have a conservative cost estimate we are including interest at 4% of the investment cost.

Overhead—We are using an average figure of 25% on the direct operating costs—including the value of H$_2$S.

Amortization—In calculating total costs we are using a 7 year period, as a 5 year amortization is being granted on 75 to 85% of the investment.

Operating cost calculations vary from company to company, but it is believed that the above costs are conservative and the total costs derived will be realistic.

Investment Costs — As is well known, the cost of plants vary widely, depending upon the specifications required by the customer, the degree of automatic operation desired, and the efficiency of the plant. The investment costs cited are conservative and represent a completely automatic plant using refinery specifications.

Gross Income—This has been calculated based on long tons (2240 lb.) of sulfur produced at $22 per long ton. The annual production is based on 330 operating days, which is conservative.

The above items result in the cost calculations itemized in the accompanying table. In each case equipment cost represents 50% of the orginal investment cost figure.

The decision to build a sulfur plant, as usual, involves many details. The location of the plant and the point of use of the sulfur should be considered. In some cases, the sulfur is more valuable to the producer than the market price, and in some cases it is necessary to utilize the H$_2$S due to local ordinances. The cost calculations given in the table indicate that a production of 5 long tons per day is the minimum that should be considered on a conservative basis.

Cost Figures—Sulfur from Hydrogen Sulfide

Case I—15 tons day (4,950 tons year)

Original Investment, single stage plant		$120,000.00
Gross Income, @ $22 ton, 15 tons day, 330 days yr.		108,900.00
Annual Operating Costs:	**1 Operator**	**½ Operator**
Manpower, @ $2.00 hr.	$17,520.00	$ 8,760.00
Electricity, @ 1c KWH	654.00	654.00
Treated Water, @ 50c 1000 gal.	1,990.00	1,990.00
Maintenance, @ 25% of equipment cost	15,000.00	15,000.00
Value of H$_2$S as fuel, @ 7½c 1000 SCF	12,160.00	12,160.00
Interest, @ 4% of investment	4,800.00	4,800.00
Overhead, @ 25% of direct costs	11,831.00	9,641.00
Amortization, on 7 year basis	17,143.00	17,143.00
TOTAL	$81,098.00	$70,148.00
Cost per Ton of Sulfur	16.40	14.15
Profit before Taxes	27,802.00	38,752.00
Payout before Taxes, without Amortization	2.67 yrs.	2.15 yrs.

Case II—10 tons days (3,300 tons year)

Original Investment, single stage plant		$80,000.00
Gross Income, @ $22 ton, 10 ton day, 330 days yr.		72,600.00
Annual Operating Costs:	**1 Operator**	**½ Operator**
Manpower, @ $2.00 hr.	$17,520.00	$ 8,760.00
Electricity, @ 1c KWH	436.00	436.00
Treated Water, @ 50c 1000 gal.	1,326.00	1,326.00
Maintenance, @ 25% of equipment cost	10,000.00	10,000.00
Value of H$_2$S as fuel, @ 7½c 1000 SCF	8,100.00	8,100.00
Interest, @ 4% of investment	3,200.00	3,200.00
Overhead, @ 25% of direct costs	9,345.00	7,155.00
Amortization, on 7 year basis	11,430.00	11,430.00
TOTAL	$61,357.00	$50,407.00
Cost per Ton of Sulfur	18.60	15.20
Profit before Taxes	$11,243.00	$22,193.00
Payout before Taxes, without Amortization	3.54 yrs.	2.39 yrs.

Case III—5 tons day (1,650 tons year)

Original Investment, single stage plant		$50,000.00
Gross Income, @ $22 ton, 5 tons day, 330 days yr.		36,300.00
Annual Operating Costs:	**1 Operator***	**½ Operator**
Manpower, @ $2.00 hr.		$ 8,760.00
Electricity, @ 1c KWH		218.00
Treated Water, @ 50c 1000 gal.		663.00
Maintenance, @ 25% of equipment cost		6,250.00
Value of H$_2$S as fuel, @ 7½c 1000 SCF		4,050.00
Interest, @ 4% of investment		2,000.00
Overhead, @ 25% of direct costs		4,985.00
Amortization, on 7 year basis		7,143.00
TOTAL		$34,069.00
Cost per Ton of Sulfur		20.60
Profit before Taxes		2,231.00
Payout before Taxes, without Amortization		5.35 yrs.

* Use of a full time operator and same cost procedure shows that the plant is not economical.

GATE VALVES BY THE HUNDREDS, stockpiled and awaiting reconditioning, or possibly scrapping

DENTED, DIRTY, RUSTY DRUMS, as received at the shop, are soon restored to useful service

Valves and Drums as Good as New

Sinclair uses "production line" techniques in successful salvaging operations at their Houston refinery

By C. N. VALLETTE, Salvage & Valve Dept. Foreman, Sinclair Refining Co., Houston

As told to D. P. THORNTON, Jr., Southwestern Editor

THE salvaging of useful items from discarded materials at the Houston refinery of Sinclair Refining Co. and reconditioning them to good-as-new status has developed through the years into a fine art. Not a great deal of it is done "by the book" and the work is primarily confined to valves, flanges, pipe, fittings and the like, and used drum reconditioning, but it pays dividends.

Valves are the big end of the work, of course, as would be anticipated. In 18 years of valve repairing, the Salvage and Valve Department can count the complaints it has received on less than 10 fingers.

A review of annual reports for this department over the past few years is illuminating. In general this reveals that:

1. The average repair cost for refinery valves (excepting those used in conjunction with control instruments, 18-in. motor operated Houdry unit valves, and small cocks, plug valves, etc.) is about 15% of the average replacement cost, FOB refinery warehouse.

2. If the expensive Houdry unit valves were included the figures would be badly distorted because repair cost usually is rather small, comparatively.

3. If the general run of refinery valves were repaired by an "outside shop" it is estimated the cost would average 40% of list price. This is more than double the amount Sinclair now spends.

An illustration of the savings accruing from salvage department operations is shown in Table 1. No revenues from scrap metal sales are included as these are more affected by conditions in the steel market than refinery operations. The recovery values shown, analogous to "profit," were obtained by dividing the total cost of repair labor and parts into the total laid-down cost at Houston of all steel valves repaired. A similar comparison is made for flanges, data being based on spot checks as this is not a full-time operation.

Table 1—Value of Salvage Operations

(Based on Replacement Cost FOB Houston Refinery)

Year	Valve Repairs* No. Units	Valve Repairs* Recovery, per $1 Spent	Steel Flange Reconditioning Recovery, per $1 Spent
1945	1194	$6.35	
1946	1324	7.45	$2.36
1947	1704**	8.44**	3.01

*Excludes Houdry and motor-operated valves, 24" butterfly valves, plug, small brass and forged valves, gage cocks, compressor valves and miscellaneous items.

**Includes 320 steel valves from dismantled Corpus Christi, Kans., refinery. Normal average is 1200-1400 valves/year.

Not shown in the table but of more than passing interest is the fact that approximately 20% of the revenues from scrap metal sales pays for the labor in assembling, segregating and sorting it. Furthermore, scrap metal sales revenues usually come close to paying the cost of maintaining the entire salvage department, without considering the value of the items reconditioned in the course of a year.

A breakdown of shop expense for all labor and materials for a representative year is shown in Table 2. Amortization of capital investment is excluded. The value of scrap sold exceeded all operating costs by $1572.

At Houston the scrap is always graded as to size and kind, segregating the various metals as pipe, plate, turnings and the like, in brass, carbon and alloy steels, and cast iron. To this end, the scrap produced by the various refinery departments and shops all is turned over to the salvage yard as it accumulates. In the

past the practice has been to sell graded scrap metal three or four times yearly on a competitive bidding basis, the volume amounting to about 20 cars at each sale. Now, due to the urgent demand for scrap by melters, an attempt is made to hold such sales monthly.

In addition, while sorting the scrap pile, all sections of usable pipe still meeting plant standards after reconditioning are separated into stocks which ultimately find their way to the salvage storehouse. Attached fittings are cut or screwed off and the pipe cleaned and straightened as necessary. It then is racked as to size, wall and length.

Repaired Items Are "Free"

An interesting wrinkle is involved in re-using salvaged materials. In part this develops from the fact it's just natural to prefer using a new rather than a reconditioned item, no matter how serviceable it may be, and also for reasons of cost accounting. Reconditioned items are not assigned a cash value in inventory control. When the article is reconditioned it is not sent to the central storehouse, but to a nearby "salvage warehouse," instead. Before a new item can be drawn from central stores, however, the requisition must be first endorsed by the salvage warehouse as "not in stock." This assures that reconditioned items will be used first.

A further incentive is that supplies for a unit coming from the salvage warehouse are not charged against the unit. On the other hand, new items from central stores are charged and appear in the accounting records automatically.

Thus the reconditioning program is reflected only in refinery purchases of new material, even though individual salvaged items actually are not involved as debits and credits in accounting procedure. In fact, no record whatever is kept of the many small valves handled and conservatively low estimates based on spot-checks are available. Likewise, no formal records are maintained for the no-charge odd jobs handled by the salvage department on spare-time or emergency assignment.

As an illustration of the latter, recently a shipment of alloy keys for bubble caps was received. Through a slip-up somewhere they were slightly too large. A 30-in. magnetic chuck grinder was pressed into service by the salvage department to bring them to size in a few hours' work. Incidentally, this large grinder has paid for itself by time-savings alone in grinding all weather-type compressor valves in the plant, plus other odd jobs.

It was originally purchased and amortized for special work on large motor-operated Hoadry valves which could not be handled with available refinery machine-tools.

Space does not permit detailing of the department's growth "from scratch" through the years. Suffice it to say that 18 years ago it started as a one-man, part-time operation, with only the simplest of repairs and cleaning being done to small valves; a labor crew piled up scrap which was sold from time to time. Now, a three-building shop has just been completed. There is a "salvage warehouse" and a large scrap storage, receiving and sorting area. From one man part-time the salvage operations have grown to require a permanent staff of foreman and assistant, two first class machinists, second class machinist, first class machinist helper, second class machine operator and four laborers. Occasionally other specialized help, such as welders, are drawn from other departments as necessary or when the work cannot conveniently be sent to the appropriate plant shop.

Equipment consists of two 24-in. and one 14-in. lathes; a small bench lathe; the Arter grinder; two lapping machines, and numerous small drill presses, grinders and miscellaneous hand tools. In addition, there is a 15 ton home-made hydraulic press used to crush nipples out of threaded flanges; and several shop-made jigs, mostly for valve work. Several overhead trolley cranes handle heavy objects.

The salvage department has no concern with two additional items of refinery equipment which, together, make up the bulk of a refinery unit. These are heat exchangers, which are cleaned, salvaged and repaired by the boiler shop; and instrument-actuated control valves, the exclusive responsibility of the instrument shop. Scrap and discards from these two departments come to the salvage department for disposal, however.

Valve Repairs Pay

Since valves are the principal item repaired by the salvage department, much of this work will be described in detail. It is strictly a production line operation and, since it differs in many ways from similar work done in other refineries, it deserves more than passing mention.

The reason why many refinery managers feel that complete valve reconditioning on the premises does not pay, or at best just breaks even, is that the work is usually tried out as a side-line rather than on a production line basis and often has been inadequately supervised. This is the studied observation of C. N. Vallette, based on many years' experience in supervising Sinclair's salvage operations at Houston. In his opinion, the trouble frequently lies in making valve repair a "pick-up" job for the machine shop, where many individuals are involved but no single person is formally delegated the specific responsibility for the work.

"One man may start on a given valve, for instance," he illustrated, "only to be called off for some other job. Then another, temporarily free, starts in where the first man left off. Perhaps he does not know, cannot determine or fails to try to find out how far previous work has progressed. Pieces of that valve may be all over the machine-shop, or laid aside because a special machine is being used for something else. Time piles up. Pieces get lost, damaged, thrown away. On top of that, there is no one man who is a specialist in the work, and no coordinator. As a result the work may not be efficiently done."

Another common practice which jumps the apparent cost of home-spun valve repair when run on a pick-up basis is that the operation may be used as a convenient catch-all for charges on the small, perhaps 5 to 60-minute miscellaneous jobs which constantly develop around any plant's central shops. These can accumulate into quite a respectable sum in a year's time and result in valve repair costs being unfairly inflated. Management, on the other hand, may not realize the extent of this "padding" and therefore wrongfully concludes that on-the-premises valve repair is unreasonably expensive.

When valves are brought to Sinclair's salvage department, a quick visual inspection eliminates any which obviously are too damaged to warrant repair. They are cannibalized before disposal to scrap.

The remainder are sorted as to size, class, and make and thereafter await their turn for cleaning, more thorough examination and repair. Small globe and other valves are similarly treated. At the beginning of 1950 the salvage department had on hand, awaiting attention, approximately 1200 flanged valves of 2-in. and larger, including large 18 and 24 in. cast iron gate valves.

Table 2—Breakdown of Operating Expense

(Capital Investment Excluded)

Parts and Labor	Per Cent of Total
Reconditioning pipe and fittings*	31.6
Sorting scrap metals, estimated	20.7
Repairing:	
Steel valves	35.0
Screwed flanges and fittings	4.4
Steel flanges	1.8
Large Hoadry valves	2.5
	100.0

*No machining operations.

SPECIAL JIG FOR REFACING cast-iron gate valve wedge which has been built up with weld metal

Repair Procedure

The best illustration of procedure is to follow a batch of 50 four-inch valves through the salvage shop. They have come from one or more units and may have been awaiting attention for some time until stocks in the salvage warehouse grew low, in the usual course of events. The usual batch ranges from 30 to 60 individual valves, the number generally based on the size of the valve.

The number on each valve is noted along with make or an arbitrary number assigned. The batch is grouped by make. The valves are torn down by a helper and the bodies and internals cleaned. Simple tanks equipped with steam coils and baskets are used. The cleaning compound is a spent soda ash wash solution from the lube agitators. It contains heavy bottoms and sodium sulfonates among other things and reportedly "does the trick beautifully." The cleaning action compares favorably with commercial cleaning agents. Inasmuch as this cleaning material costs nothing and is a refinery waste, this is just another small salvage saving.

A water wash follows the cleaning solution. If necessary, bodies and parts are further cleaned by laborers with wire brushes, chisels and the like; genetally a wire brush in an air-operated tube cleaner is all the further cleaning required.

The valves now are ready for inspection by a permanently-assigned first-class mechanic, a valve specialist. During inspection, body showing indications of thin spots, pitting and other evidence of corrosion either is discarded or reserved for the visit of a regular inspector if a doubtful case. Bodies destined for scrapping are stripped of all usable parts, such as neck bushings, packing glands, stems, wedges, bolts, etc. If a valve fails to pass inspection it is almost invariably scrapped. It is rare that a body will be repaired but de-rated, because of the ever-present danger the warning tag might get lost or overlooked and the valve reinstalled in a service for which it is no longer suited.

The first repair operation is to remove all wedges or gates from stems. Wedges of like make are segregated into two groups, one requiring refacing and the other for build-up. The first group are processed in the shop, while the latter are sent to the welding shop for rebuilding with brass or stainless steel. Generally stainless steel is used because the labor cost is the same while the greater weld metal cost is more than offset by increased service life.

Stems receive similar treatment, and are built-up in the welding shop like the wedges, under a definite work order. Spare gates and stems are withdrawn from storage to make up any deficits. It is not often that new valve parts are used, however, experience having shown that an old part generally can be rebuilt for less than a new part costs. Also, parts stocks are continually being augmented from valves being rejected to scrap.

The bodies are next inspected to determine whether rings need refacing, must be replaced or built-up. Those not requiring new rings (or build-up with weld metal) immediately are refaced in the lathe, using a special jig shown in Fig. 1 and proceed down the assembly line without regard to brand. The others are segregated for a trip to the welding shop or for a ring-replacement.

A second-class machinist now takes over, tapping a rebuilt or new wedge of the proper bottom thickness (to correspond with distance between seat rings) into position in the valve body for a preliminary water test before any further refacing with that particular valve body jig is attempted. Each valve, with bonnet openings vertical, is filled with water around the gate and inspected for "sweating" or leakage. The tapping also makes a slight impression of the seat rings on the wedge, since neither are lubricated.

If a uniform impression results on the wedge there is no sweating and the valve is ready for reassembly. Refacing of remaining valves proceeds. A failure means that the jig is not properly set-up, there was dirt between valve flange and jig, or between jig and lathe chuck.

Valves now are laid out for reassembly. A floor-mounted vise is used and the man sits down at the job. There is little danger of injury, because the valve can not be overturned through carelessness and cannot fall to possibly crush or cut a foot or hand.

Following assembly the valves are tested hydraulically to working pressure, completely packed and properly lubricated. They are painted on

the outside with lubricating oil cut with kerosine. Final painting is not done until installation on an operating unit. Reconditioned valves are not necessarily reinstalled on the same unit from which they came to the salvage department.

Repaired valves then are compared with the original number tally and are sent to the salvage warehouse. When all valves requiring a minimum of attention have been checked out as finished, the machinist then turns his attention to bodies needing reringing, to machining stems and to wedges needing rebuilding if spare wedges are not in stock.

Rings and bodies in all valves repaired by the salvage shop are refaced to give a standard angle of 5° from the vertical, regardless of the manufacturer's standard angle. Likewise, all wedges, or gates, are tapered to conform. This reduces the spare parts inventory materially.

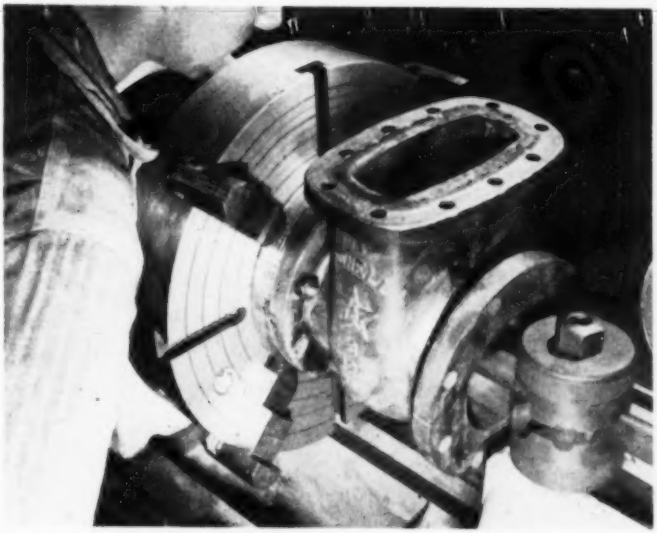
The jig used for holding a valve body consists of a large plate adapter having the arbitrary "Sinclair standard" taper of 5° on one side. The valve is bolted onto the plate and the whole chucked into a lathe for refacing.

Selection of the valve size (no distinction as to make) to be processed through the "reconditioning line" is based on two factors, in general. The first in order of importance is the approximate inventory in the salvage warehouse compared with anticipated plant needs and the second is the size of the valve-pile awaiting attention. A third, but infrequent, factor is an emergency plant need which automatically supersedes any other job.

All "stock run" valve work is stopped and the staff is put to repairing any valves needed at once, such as during a major unit turnaround. Or, if caught up on steel valves, the whole crew may fall to work on the cast iron valves, or flanges, or construction of some specialized equipment for the shop. But they are always busy.

Flange Reconditioning

Another full-time machinist takes care of all steel flanges with the assistance of a trainee. In addition, this machinist handles all small valves: forged steel, needle valves, globe valves, plug valves, cocks and the like. Again, he operates on an assembly line basis, dropping valves for flanges when the need is apparent and stocks accumulate. The rule is followed that valves requiring least attention get "the works" first. The rest are taken in the order of the repair needed. But the whole batch goes through before a new group is brought in. Then, as stocks indicate, "time off" is taken to make up a new stock of parts. The same holds true for flanges.



BORING BAR AND SPECIAL JIG for refacing seat rings on 6-in. valve

Steel flanges often require only a light facing cut to restore them to full usefulness. Such are handled first. Carbon steel flanges can be salvaged by undercutting that portion of the facing which would be subject to corrosion, and building up with either 18-8 stainless steel or the 25-20 grade at the welding shop. Normally the latter grade is used for greater service life because the labor cost is the same.

The built-up flanges are refaced and made into specification ring-groove, ground joint, or raised-face types, depending upon what is most needed at the time. The new rating is noted on the side of the flange by writing "18-8" or "25-20" with the welding electrode.

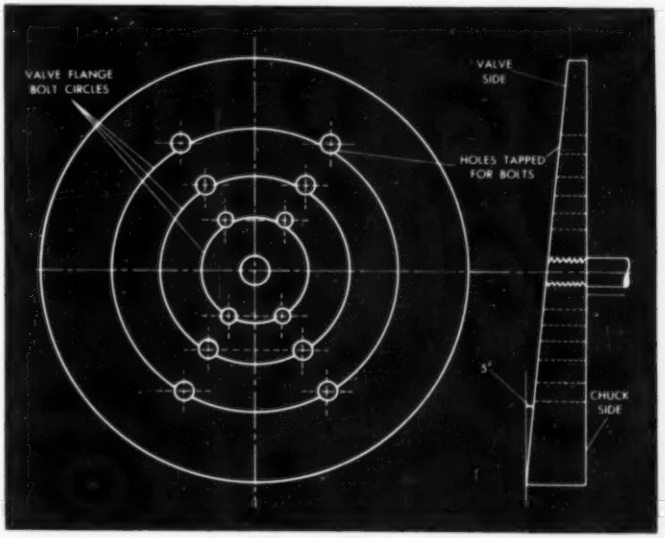


FIG. 1 Sketch of jig used to give "Sinclair standard" taper in refacing seat rings for gate valves

GATE VALVE SEAT REFACING. jig arrangement and partially finished job

WEDGE REFACING JIG has special ball clips for centering on chuck lips; see top and bottom jaws

Rarely are welding neck flanges repaired by welding on a new neck when the original has become too short. There is too much danger of upsetting metallurgy by the heat. Instead, they are converted to slip-on types by boring. Alternatively, they may be built-up refacing with high alloy, as previously mentioned, and suitably marked.

The screwed-type flange gradually is becoming less common in refinery piping but, in older plants, a lot of them usually are on hand for reconditioning. When they are removed from a unit, however, the usual practice is to burn them off the pipe. This stub can be removed by unscrewing the pipe, but this operation is always slow and dangerous, and is all hand-labor.

The salvage yard developed a nipple-crusher, hydraulically operated and built of miscellaneous discarded parts. It was described in *National Petroleum News Technical Section*, 38, No. 18, May, 1946, p. R-338.

Briefly, it consists of an I-beam structure containing an oil-actuated piston carrying a counter-balanced cross-head and a 4 in. diameter ram to which a chisel is attached. The nipple on the flange is placed in a V-notched block, shimmed up as necessary to handle pipe sizes from 2 to 12 in. The flange is held in position by one man until the chisel makes contact with the pipe, the machine being started by another man. The first man gets clear while the operator watches the crusher until the job is completed.

Secret of the operation is applying force to the chisel gradually and not imparting a blow. The latter would only shear the nipple out of shape and complicate the job.

Special Jigs

Mention has been made of special jigs used for facing seat rings in place or following build up with weld metal, and for building up and tapering gates. These are ingenious and worthy of special mention.

The body (seat-ring) jig, mentioned previously, consists of a circular steel plate to which is tapped a rod threaded on each end. The rod is passed through the lathe spindle and held in place with a nut until the chuck jaws are run down. The plate and chuck must be absolutely free of high spots, indentations, dirt, cuttings and the like which would throw the outer surface of the plate out of precise alignment. The outer face of the plate has several concentric circles corresponding to the range of valve sizes of given make that it will accommodate, and is inclined at 5° to the rear surface of the plate in contact with the face of the chuck. One plate will accommodate three or four valve sizes.

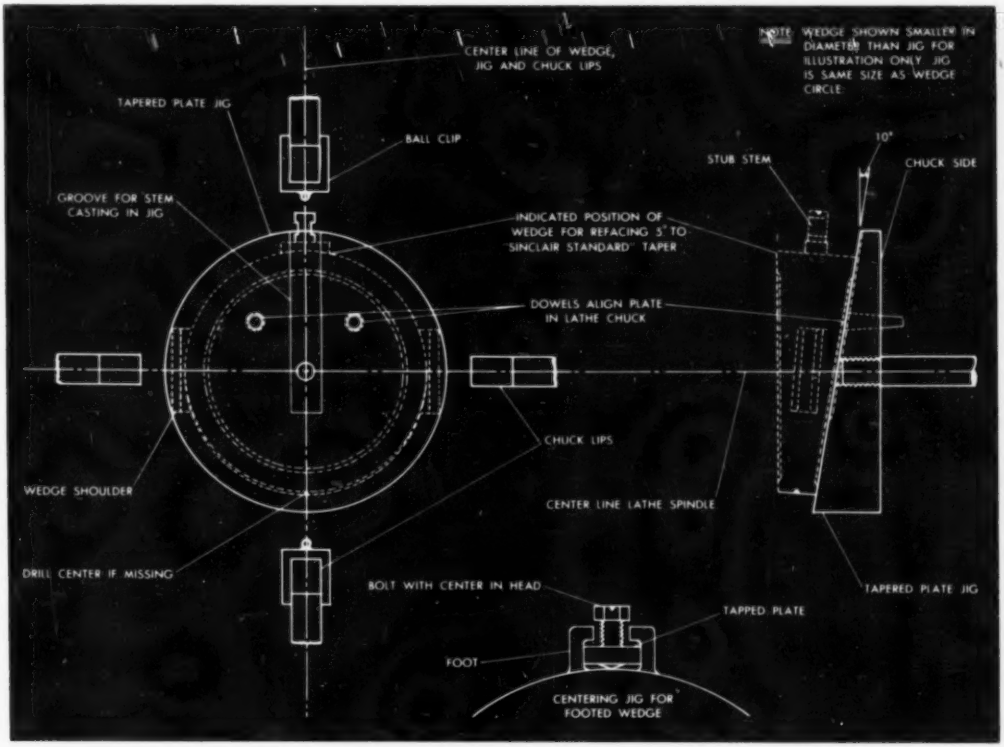

CENTER LINE OF WEDGE, JIG AND CHUCK LIPS
NOTE: WEDGE SHOWN SMALLER IN DIAMETER THAN JIG FOR ILLUSTRATION ONLY. JIG IS SAME SIZE AS WEDGE CIRCLE
TAPERED PLATE JIG
BALL CLIP
10°
STUB STEM
CHUCK SIDE
GROOVE FOR STEM CASTING IN JIG
INDICATED POSITION OF WEDGE FOR REFACING 5° TO SINCLAIR STANDARD TAPER
DOWELS ALIGN PLATE IN LATHE CHUCK
CHUCK LIPS
WEDGE SHOULDER
CENTER LINE LATHE SPINDLE
DRILL CENTER IF MISSING
BOLT WITH CENTER IN HEAD
TAPPED PLATE
TAPERED PLATE JIG
FOOT
CENTERING JIG FOR FOOTED WEDGE

FIG. 2—Details of wedge-refacing jig with special ball clips

Four holes for each valve size are tapped to take bolts through the corresponding holes in the valve flange. The two bottom holes are centered on the bolt-circle and the other two (top) are sufficiently offset so that the valve will be held in precise alignment with the centerline of the seat ring coinciding with the centerline of the plate and lathe spindle. The body is hung on two studs with bonnet opening up; the other two are placed at the bottom and the nuts then are run down.

With this arrangement, no time-consuming set-up on the lathe is involved. The plate is chucked, the valve bolted on, and the exposed seat ring refaced with a boring bar inserted through the fluid passage. The valve is removed and the other flange bolted to the plate, whence the operation is repeated. The only precaution is that the face of the valve flange, as well as the chuck and both sides of the plate, must be clean and free of dirt, cuttings and high spots.

The wedge refacing jig and likewise the lathe set-up is somewhat more complicated. It, too, basically consists of a plate, tapered on one side 10° out of the vertical, and provided with a threaded stem carried through the lathe spindle to hold it in place.

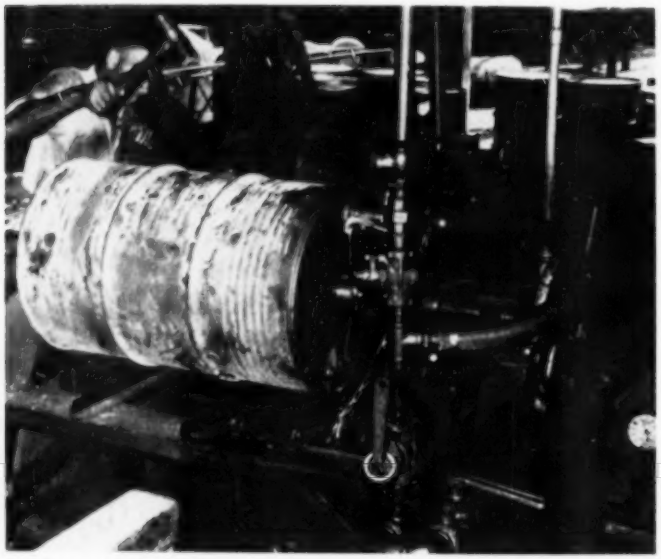
It differs in that an individual plate and lathe chuck for every wedge size is required, and two clips, fitting over opposed chuck jaws, are used to position the wedge. The clips each carry a small ball (from an old ball-bearing) which fits centers provided on the wedges.

In setting up such a plate for the first time, it is brought against the front of the chuck, the two meeting surfaces being absolutely clean, free of indentations and high spots, and held in place with a nut. The two clips are attached on opposite jaws of the chuck. The plate then is oriented until the taper centerline coincides with the arbitrary centerline between the two balls mounted on the clips. Following this operation, two holes are bored and taper reamed through the plate and into the chuck, into which tapered pins are driven flush with the outer face of the plate or slightly below.

This arrangement is diagrammed in Fig. 2. So long as this individual chuck is used with a specific plate, future set-ups can be quickly made. This involves inserting the plate in the chuck, turning it until the pins can be driven, and attaching the clips to the jaws of the chuck. Separate plates are required for each size of valve wedge to be processed, and should be suitably marked.

Most gates already have a center drilled in the bottom of the wedge. A short section of valve stem with a center drilled in one end and having a wrench flat, is substituted for the original valve stem. If there is no center in bottom of the gate, one should be drilled in. An approximate position, located by a scale is sufficiently accurate.

The wedge, with stub-stem, is placed against the plate already in the chuck and rotated until the two balls can be run snugly into the centers to hold it. The other jaws of the chuck are run down against the guide shoulders on the gate to hold it tightly for facing. Finally, the tail stock is run in against the gate for added security. Care should be taken to exert no more pressure with the clips than is necessary to hold the wedge in place until the other pair of jaws are run down, as these do the actual holding during machining.



HYDRAULIC DE-DENTING, first operation in drum reconditioning, uses 60 psig water and occasionally a rubber hammer

The wedge now is faced in the usual manner on the exposed side. When completed its position is reversed and the other face machined. The finished gate will have a 5° taper on each face, corresponding to that of the valve rings, and should seat perfectly when installed in the valve.

If the wedge has been built up by welding, high spots on the surface need not be ground down before it is placed on the lathe. Establishing a taper should not be attempted.

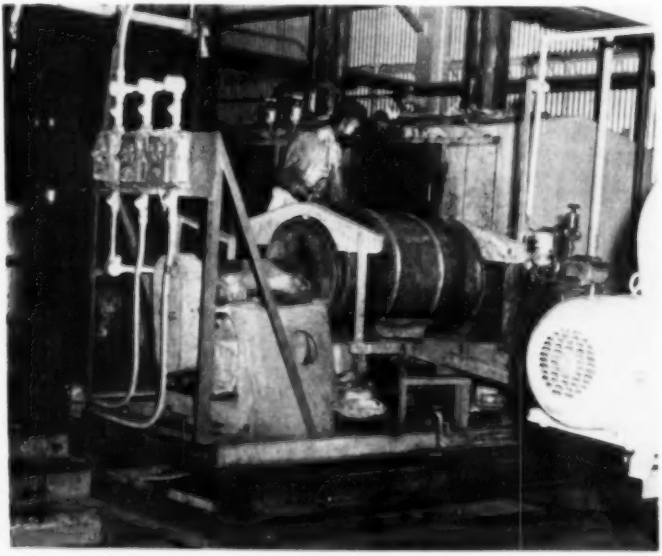
Footed type gates may already have a center drilled in the bottom of the foot. Other footed-type wedges do not have a center. In either case, the salvage shop uses a small plate which will fit into the foot loosely. The plate is tapped to carry a small bolt with a center hole drilled in its top. The plate is placed in the foot and the bolt run down until the plate is firmly jammed in the foot; the ball on one of the clips then is placed in contact with the center in the bolt. If there is no center in the bottom of the wedge, one is supplied as described for screwed stem types.

New Shops

At the present time, salvage operations are just getting back "on-stream" after a few months vacation occasioned by tearing down the old building to make way for a new process unit, and the move to new quarters near the Houston Ship Channel.

Where the shop formerly was housed in a single building, the new facilities consist of three, specifically designed for salvage operations. Besides, suitable areas have been provided to receive incoming materials, for sorting, and scrap segregation.

The larger building houses offices and the main repair shop. Cleaning vats are partitioned off, with outside entry. A small building to one side holds spare parts, a working inventory being kept in the main building. The third, with open sides, is used for sorting valves as to size and tearing down preparatory to cleaning. The original salvage storehouse across the street from the central plant storehouse continues in use. It is in charge of a "pipefitter feeder" whose duty it is to get requisitioned supplies to the pipefitters from either warehouse.



CHIME SEALING AND STRAIGHTENING, another step in drum repairs, is done on this specially-designed machine

Barrel Reconditioning

An operation entirely separate from the salvage department, as such, is the reconditioning of steel barrels used for various lubricants. When these barrels are returned by a customer, they often are indeed in a sad shape, but a large majority of them can be reconditioned for satisfactory re-use. Although carried on by another department, at the barrel house, it is distinctly a salvage operation and this article would not be complete without a description.

An hydraulic barrel de-denter and a chime-straightener complement the usual facilities of a barrel house or grease plant for cleaning and repainting used drums. At Sinclair the installed equipment is capable of reconditioning from 650 to 700 barrels per eight-hour day. That means a reconditioned barrel comes off the end of the line every 41 to 44 seconds! In many cases it is difficult to tell reconditioned from new barrels.

Banged-up returned drums are inspected, inside and out, to determine

further usefulness and suitability for reconditioning. Drums which pass are conveyed to the hydraulic dedenter, a machine developed by the Houston plant's engineers for this purpose.

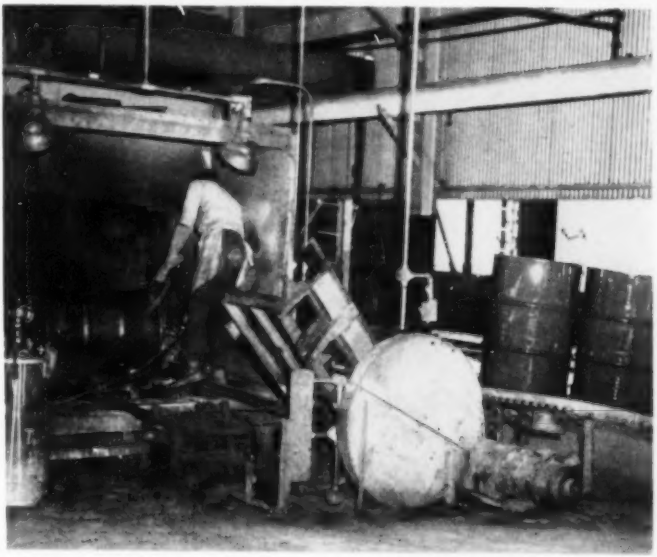
Here they are lifted into proper position. A pull of a lever and a steel plate is squeezed against the bottom while another, carrying a nozzle which fits the filler-hole, goes against the top (see photographs). Water at 60 psig fills the barrel automatically, blowing out the dents. Occasionally it is necessary for the operator to "assist" by striking stubborn dents with a rubber-nosed hammer, and straighten chimes enough for the plates to fit tightly. The barrel then is rolled over a drain section and finally onto a conveyor to the cleaning section.

A battery of six "Portco" cleaners in parallel is provided for the next operation, into which barrels are loaded by hand, and in seven minutes cleaned down to bare metal. They are first sprayed inside and out with a caustic solution to remove paint, grease and dirt. An automatic timer then shuts off the wash pump and opens an air solenoid valve to siphon out the caustic solution. Next, a rinse with fresh water removes any last trace of the caustic from the drum. After the rinse water is siphoned off the drums are blown with hot air to dry them completely.

A down-hill track carries the barrels from the cleaners to another device adapted for the purpose, the chime-straightener and sealer, an automatic operation performed at the pull of a lever. Straightened barrels are ejected onto another section of down-hill track to enter an automatic buffer. The chime straightener consists of two thin, disc-shaped rolls, slightly smaller than the diameter of the barrel, and a pair of common bottom rolls. When the barrel is in position, the end rolls are squeezed tightly against the chime by the pressure from the bottom rolls. The motor-driven end rolls then straighten and tightly seal the chimes as they rotate.

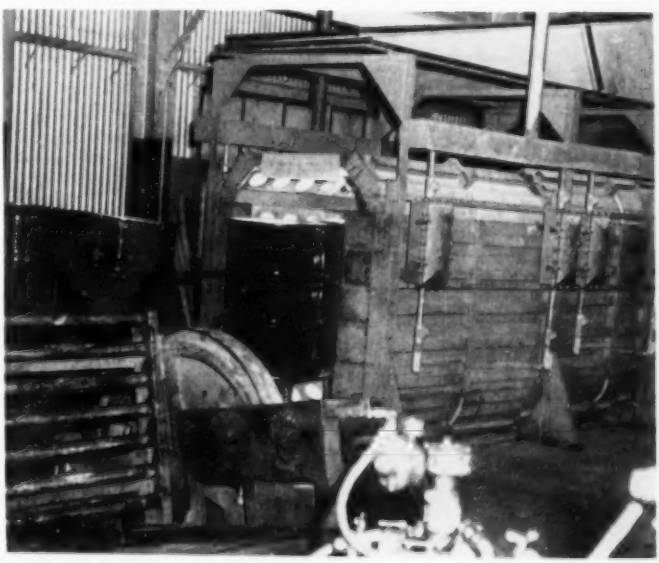
The automatic buffer has three revolving wire brushes, cam-actuated by a trip thrown automatically when a barrel is in proper position. The top brush, longer than the barrel, buffs the barrel as it imparts rotation by friction; simultaneously the ends are polished by the remaining two brushes brought against them laterally. When the cams release the brushes from contact the now thoroughly-clean barrel continues its down-hill roll, winding up in the entrance to the paint booth.

The painter is a "two-gun man," since Sinclair's barrels are painted green on the side, aluminum on both ends. The barrel rapidly spins on its side while the operator, a paint-gun in each hand, sprays one end, then the side and finally the other end. Finished, he steps on a lever which simultaneously ejects the painted barrel, up-ends it onto a conveyor, and positions a cleaned one.



"TWO-GUN" MAN spray paints sides and ends of drums. Then they're up-ended and sent along the conveyor to a drying oven.

The up-ended barrel then passes through an infra-red drying oven. The painter takes approximately eight seconds for his job. Four and one-half minutes later, the drum is dry and on the road, to the stenciling room, ready for filling.



INFRA-RED DRYING OVEN, from which finished drums emerge in about four minutes.

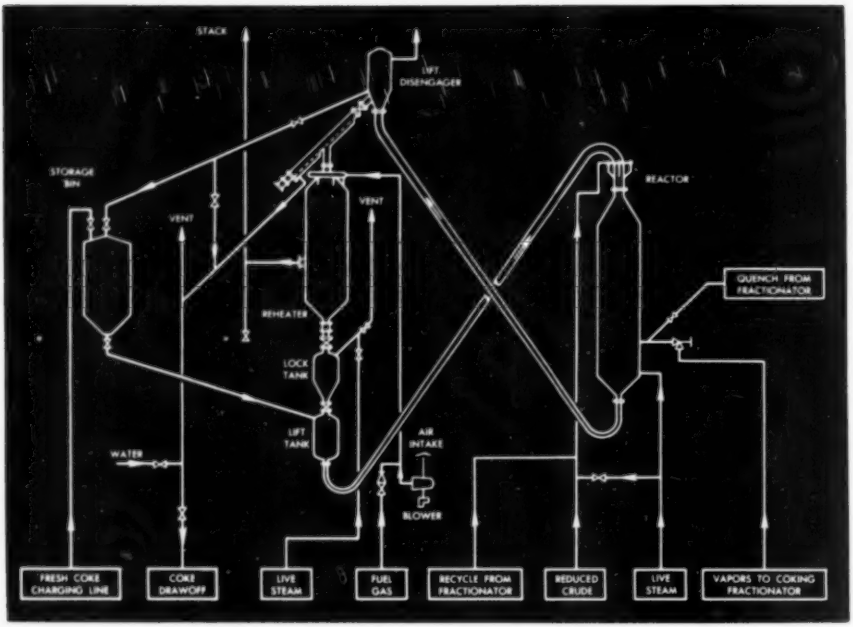


FIG. 1 Simplified process flow diagram of Continuous Contact Coking process

Continuous Contact Coking of Heavy Charge Material

Continuous contact coking is applicable to very heavy stocks comparable to bitumen obtained from the Alberta oil sands in Canada. Yields and product distribution are shown from data from operations of a semi-commercial unit on a 4 API gravity Wilmington, Cal., asphalt. This paper was presented before the Athabasca Oil Sands Conference, Edmonton, Alberta, Can., Sept. 12, 1951

By E. R. SMOLEY and A. H. SCHUTTE
The Lummus Co.

THE processing of the gummy bitumen separated from the Alberta oil sands, containing about 30% water, 4% sulfur and some 2-3% minerals, for recovery of distillate fuels is similar to the problems of handling shale oil and heavy petroleum pitches and asphalts.

Coking has been used for converting such heavy materials to lighter distillates and coke. Also removed along with the the carbon are heavy materials or metallic compounds which would cause serious troubles in further process steps. To illustrate, coking of heavy petroleum residues removes coke and metals like vanadium, which increases catalyst life in catalytic cracking or other process operations charging this coker distillate.

Coking of bitumen would yield a synthetic crude oil of low carbon and mineral content which could readily be refined by conventional methods and further upgraded by such a process as hydrogenation to produce premium distillate fuels.

The Continuous Contact Coking process lends itself to operation on extremely heavy materials from a wide range of origins, including petroleum pitches, asphalts, naturally occurring bitumens and shale oil. In the process a continuous stream of coke particles circulates through the reactor vessel and reheater, as shown in Fig. 1. Circulation is obtained by means of mass flow lift which elevates the material as a dense unagitated column. Power for the lifting is provided by high pressure steam. The charge material is contacted with the reheated circulating coke at its entrance to the reactor in such a way that uniform distribution of the oil on the coke particles is obtained.

At the oil-coke contacting zone, the lighter portions of the feed are vaporized and the heavier unvaporized material is taken up as a liquid film on the coke particles. The wetted coke particles travel down slowly through the coking reactor as a compact bed and are allowed a residence time of approximately 30 min. to complete the coking and drying reaction. At an intermediate point in the reactor, the product vapors are removed through an internal drawoff device and the coke descends below this vapor disengaging zone into a stripping zone where the final drying out is obtained in an atmosphere of steam.

The dried coke particles are then elevated to the spent coke lift disengager from which they flow by gravity into the coke reheater under control of a remote operated valve which determines the coke circulating rate in the entire system. In the reheater, the coke drops on to a free pile subjected to radiation from internal gas burners. Part of the heating is done by this direct radiation and part by contact with the flue gases which pass concurrently with the coke through the reheater. From the bottom of the reheater the coke discharges by gravity into the lock tank which forwards it into the high pressure lift tank for recirculation back to the oil contacting zone above the reactor.

As oil is charged to the unit, the successive layers of coke deposited on the circulating material result in a gradual increase in particle size and an increase in the inventory of

coke in the system. The larger particles are drawn off through a classifier as a product coke stream to maintain essentially constant inventory in the system. The coke product is in the form of very hard dense pellets of rounded form and low volatile content. The major dimensions of these pellets may range from 0.5 in. to 1.0 in.

This process eliminates the semi-continuous operation of coking chambers required in conventional methods, also the labor, operating supervision and utilities involved in removing the coke from the coking chambers. The yields of hydrocarbon products are superior to those obtained by previous processes and the coke product is obtained as a stream of dry, high strength pellets, free of fines. This eliminates handling losses and fines production in the transportation and subsequent processing of the product coke.

Since the heat requirements of the process are obtained from the circulating coke stream, it is unnecessary to heat the bitumen charge above the temperature required for pumpability and convenient handling. Former processes required all the heat to be put into the oil charge stream in a fired heater at temperature levels in excess of 900° F. For this reason the continuous contact process is applicable to charge materials of higher carbon residue and solids content than in the case of the delayed coker. It was also necessary in the conventional drum type coking operations to maintain the volatile content of the product coke within rather narrow limits in order to permit its easy removal from the drum at the end of the coking cycle. This, in turn, fixed the temperature level of the operation and the degree of conversion obtainable within relatively narrow limits. Since no similar limitation exists in this continuous contact process, a wide range of operating conditions and degrees of conversion is obtainable.

The applicability of contact coking to very heavy materials may be shown by referring to the semi-commercial plant data obtained on a 4.4° API gravity Wilmington asphalt of 14 penetration and 150° F. ring and ball melting point. Typical yields and product distribution in contact coking of this stock are shown in Fig. 2 for once-through and recycling conditions. It should be noted that once-through yields of about 25% C_4 to 400° F. were obtained from this material. The Research Octane number of the debutanized gasoline was 78 to 83 clear and 88 to 92 with 3 cc's of TEL.

On comparing contact coking results with delayed coking of lighter stocks where both methods are applicable, we find that contact coking produces more gas, more gasoline of a higher octane number, more gas oil and less coke than delayed coking. The data presented graphically in Fig. 2 show the decrease in end point and increase in light product yield obtainable by recycling heavy material and indicates a high degree of conversion of the recycle component. The 30% water-bitumen would be preheated by exchange and preflashed as integral part of unit to remove most of water. Data obtained from extensive operations of a 50 b/d continuous coking pilot unit are given in an earlier article.[1]

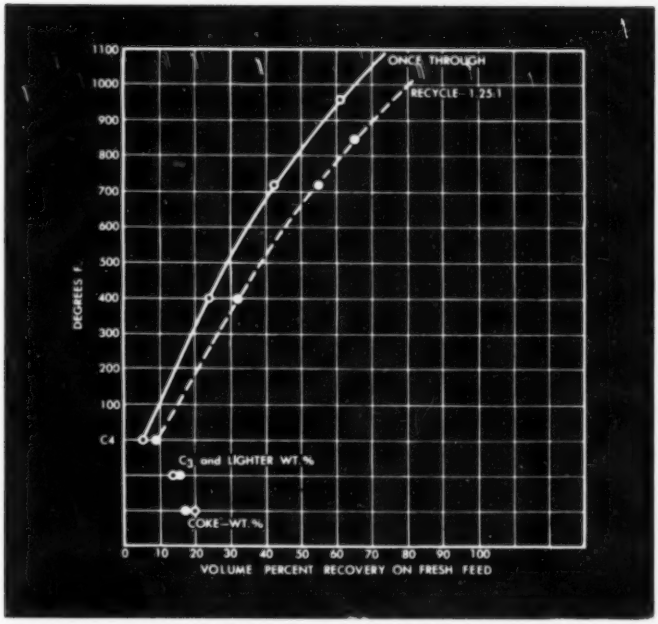


FIG. 2—TYPICAL YIELDS and product distribution for once-through and for recycling

Questions-Answers

Additional data concerning the process was given by Dr. Smudey in answer to questions presented from the floor.

Asked to give something on capital costs and operating costs, he stated the cost of building a large unit handling around 10,000 b/d heavy charge should be $1,500,000 to $2,000,000.

A rough estimate of the direct operating cost would be 35 to 50¢ per bbl. Operating costs of similar processing units of the same size could be estimated as 10 to 15¢ per bbl. for topping units; 25 to 30¢ for thermal cracking units; 30 to 35¢ for catalytic cracking.

What would be the effect of a build-up of mineral matter in the wet oil?

It is expected it would be included in the progressive layers laid down on the coke particles and thus appear as ash in the coke product. An ash content of the coke of say 10% may be an advantage when the coke is used for domestic or industrial fuel.

Will the increase in the size of the coke balls be important?

Gradual increase in the size of the circulating coke is normal and classification equipment is included in the installation.

In such a unit how does sulfur in the charge stock distribute itself? Does it concentrate in the coke?

The sulfur distribution is similar to conventional coking, the sulfur tending to concentrate in the heavy reduced crude portion which ultimately goes to coke. The sulfur in the gas oil from a 5% sulfur stock was estimated as about 3%.

What is the fuel consumption?

Dr. Smudey said an approximate estimation would range from 4 to 5% of charge. "It runs that in most cracking operations. There is a slight amount of heat of cracking and some recovery from products going out. In this type of process, the coke could probably be used as such on power generation schemes."

What form of preheater is used in front of the coke reactor, does it have tubes?

"This 4% sulfur and 2% minerals does bother a bit in pumping through a tubular heater", stated Dr. Smudey, "but it can be worked out satisfactorily at the low preheat temperature required."

References

(1) "Continuous Contact Coking", A. H. Schutte, The Lummus Co., and W. C. Offutt, Gulf Research & Development Co., Petroleum Processing, July, 1949, pp. 769.

A Statement by Anaconda on the Copper Situation

MANY users of copper have vital decisions to make . . . usually in connection with the present defense-induced shortages of copper and aluminum. This statement is an effort to remove the smoke screen surrounding the copper picture . . . to wipe away the confusion caused by too much talk supported by too few facts.

Substitution poses problems – Industry has been urged to substitute aluminum and other materials for copper. In some instances this may be logical and practicable. In many others it is difficult, if not impossible. But – before making *any* long-term decisions that may cost a great deal of money in engineering, new plant facilities or rescheduling of production operations – one should know the facts about the future of copper.

New Anaconda projects – The first major increase in copper production will come from Anaconda when the Greater Butte Project and the new Sulphide Plant at Chuquicamata, Chile, begin operations this spring. By 1953, these two projects should raise present levels of copper production by about 95,000 tons yearly.

Toward the close of 1953, Anaconda's new Yerington project in Nevada is expected to start producing at an annual rate of 30,000 tons. By then, Anaconda will be adding to the present yearly copper supply at the rate of about 125,000 tons.

Other new projects – During 1954-55 still other new projects in the U. S. and friendly foreign countries will further augment the increasing copper supply. All told, it is estimated that by 1955, not less than 450,000 tons of copper could be produced annually – over and above present production levels.

Accordingly, in 1955-56, domestic production plus imports could bring the U. S. copper supply to 1,800,000 tons yearly. This would represent an increase of about 20% over present levels. Based on historical comparisons, and barring a large-scale shooting war, this amount of copper could support a Federal Reserve Board Index of Industrial Production of 270, an increase of 24% over the present, and 45% above the first half of 1950.

• • •

These are the 'things to come' in copper. On the basis of the facts there is no necessity for considering long-range substitution of other materials for the red metal.

52320A

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Take Another Look at Coke

- Demand for metallurgical grades is growing faster than refiners can supply it.
- Price is now $21/ton for still-run grade, FOB refinery—$55-60 when graded and bagged.
- Shortage is caused by greater volume of high-sulfur crude being processed—which yields low-quality coke.
- Economics may warrant running selected feed stocks, pretreated to reduce sulfur content.

NEW YORK BUREAU

THE demand for grades of petroleum coke suitable as a source of carbon is growing at a faster rate than can be supplied by petroleum refiners, according to authorities with the carbon companies.

The aluminum manufacturers, the largest industrial user of petroleum coke in the form of electrodes, are reported finding their current expansion plans handicapped through lack of a sufficient supply of carbon available from this source. The steel industry, also expanding, is also a large user of this refinery product in the form of synthetic graphite.

The deficiency of the metallurgical grades does not stem from an insufficient total supply of petroleum coke. Rather, refiners say, it is caused by the fact that the proportion of low-ash, low-sulfur coke suitable for aluminum and steel manufacturing and other industrial uses is declining, due to the greater volume of high-sulfur crudes being processed today.

Total coke production in 1950 is estimated at 3,420,000 tons. The yield of coke today is said to be about 1.2% of crude oil run to stills, which is the basis for an estimated output of 4,200,000 tons by 1955. Immediate needs of the aluminum industry alone for metallurgical grades are estimated as 900,000 tons. Table 1 gives the relative industrial consumption of the current production of petroleum coke.

The major portion of the present output of the higher grades of coke is said to come from old coking units in refineries processing Pennsylvania and other high quality crude oils. The carbon people say that the present wide range between prices for fuel and metallurgical grades of coke would warrant refiners with coking plants to consider running selected feed stocks in their units and even treating charge stocks where necessary to reduce the sulfur content.

As presently produced, coke from drum or chamber units is said to have a range in volatility of from 8 to 18% or higher. Sulfur content will range from 0.2 to 4.2% or higher, a little greater than the sulfur in the oil being cracked. Ash will run from 0.05 to 1.6% or more, depending on the ash content of the crude processed, also whether lime or other inorganic substances were added during the processing.

Current specifications for metallurgical grade coke for steel making are: volatile matter, 4.5 to 8%; sulfur 0.50% or less; ash under 0.75%. The aluminum industry does not require quite as high grade coke in making electrodes and the accepted specifications for its use are: volatile matter 12% or less; sulfur 2% or under and ash content 1% or less. Table 2 gives a quick comparison of these requirements with the available material.

Reflecting the greatly increased demand for the metallurgical grades of petroleum coke today, current prices reported are around $21 a ton for still-run grade, F.O.B. refinery, and $55 to $60 for the same material graded and bagged. This latter operation is mostly done by the carbon companies. Ten years ago the price for still-run was $12 a ton and it had not yet become the practice to grade and bag the product. In contrast, the price for fuel grade petroleum coke has ranged between $4.50 and $6 a ton for the past years, it is stated.

"Because the petroleum refiners have not considered making of petroleum coke as an objective in their operations," said P. J. Wilson, president of the Wilson Carbon Co., Inc., "about the same percentage of petroleum coke is going into the low value fuel market as 20 years ago. Today about 48% of all petroleum cokes produced are used for steam or domestic fuel, and only about 52% in industries where it is looked upon as a source of carbon.

"These very industries are retarded in their own progress and future planning by the fact they now consume nearly 100% of the petroleum coke suitable as a source of carbon. The quality or industrial suitability of petroleum coke is declining for the convenience of the refiner, while the industrial need for carbon sources increases in inverse ratio."

The aluminum companies, says Mr. Wilson, have been required to turn to substitutes for petroleum coke as material for making electrodes even though they are more expensive. He states they are now building plants to produce carbon of the required quality from coal tar pitch. He also states the metals industry is finding greater use for the purer forms of carbon in making the high carbon steels required today.

The three major sources of carbon in open hearth steel making are (1) by-product coke, (2) low ash anthracite coal, and (3) petroleum or pitch cokes. In tests of samples of these carbonaceous materials having analytically the same percentages of fixed carbon, the Wilson Carbon Co. reported it found that 95% of the amount of carbon in low-ash, low-sulfur petroleum coke was available for steel absorption, 25% of that in anthracite coal, and 15% of that in by-product coal.

"Petroleum coke is one of the major raw materials for making anodes in making aluminum," Dr. Charles L. Thomas, former director of research, Great Lakes Carbon Co., told the Division of Petroleum Chemistry of the

Table 1—Where the Coke Goes

Industry	% Used
Aluminum smelting and refining	20
Commercial electrode manufacture	7
Steel and its alloys	10
Chemicals and pigments	1
Calcium carbides	1
Abrasives and refractories	2
Fertilizers	2
Used for fuel at refineries	1
Export from North America	3
Domestic and Steam Fuel	53

Table 2—What's Available vs. What's Needed

	Analysis of coke from drum or chamber units	Specifications for metallurgical grade coke	Specifications for aluminum industry electrode coke
Volatility	8-18% or higher	4.5-8%	12% or less
Sulfur content	0.2-4.2% or higher	0.50% or less	2% or under
Ash	0.05 to 1.6% or more	under 0.75%	1% or less

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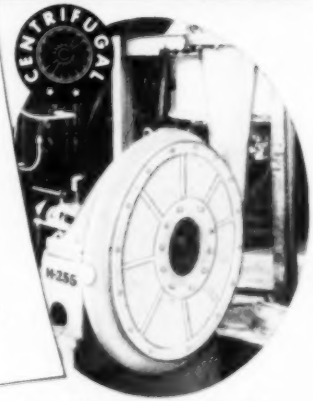

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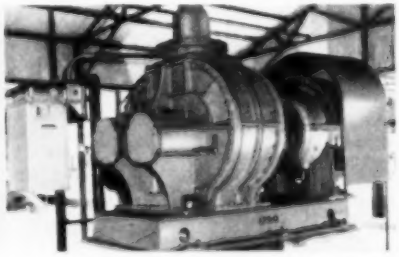

ROOTS-CONNERSVILLE
BLOWER BUILDERS SINCE 1854
ONE OF THE DRESSER INDUSTRIES

Petroleum Coke

American Chemical Society at its meeting in New York last fall.* "About 0.7 pound of petroleum coke, as it leaves the refinery, is consumed to make 1 pound of aluminum. Average yearly U. S. aluminum production for 1947-49 was 850,000 tons, which correspondingly used an average of 600,000 tons of raw petroleum coke. This is about 18% of the U. S. petroleum coke production and is its second largest use. Present plans call for an estimated 50% expansion of the U. S. aluminum industry by 1953 with a corresponding need for a total of about 900,000 tons per year of petroleum coke.

"Before petroleum coke can be used for making anodes, it must be calcined. This converts it from an electrical insulator into an electric conductor. At the same time its real density is raised to about 2.0. During the calcination losses of 15 to 30% by weight are sustained. The volatile content is reduced to less than 0.5%. Calcination may be done in shaft kilns, electric calciners or rotary kilns. In rotary kilns temperatures up to 2700 F. may be used. Care must be taken in the electric calciners not to graphitize the coke; otherwise the thermal conductivity of the product will be too high for anode use.

"Ash impurities in the petroleum coke should be as low as practical. Iron and silicon compounds in the coke are reduced and appear as alloying impurities in the metal. Lime and magnesium accumulate in the electrolyte and may cause undesirable effects there.

"Petroleum coke is the major raw material for synthetic graphite electrodes and anodes in the U. S. Taking the U. S. graphite production for 1950 as 100,000 tons, this corresponds to about 140,000 tons of petroleum coke at the refinery. This is equal to somewhat less than 5% of the production of petroleum coke. The steel industry is the largest user of synthetic graphite and its capacity is scheduled to increase about 20% by 1953. Therefore, about a 20 to 25% increase in the amount of petroleum coke going into synthetic graphite may be expected.

"The coke for synthetic graphite is also calcined before further processing. It is calcined until a sample of 35 + 100 mesh material shows an electrical resistivity of less than 0.05 ohm-inch. The same type of calciners are used that are used to calcine coke for the aluminum industry. The calcined coke retains a major portion of the sulfur present in the green petroleum coke. Low-sulfur green coke is preferred."

* "Petroleum Coke and Coking," Charles L. Thomas. Symposium on 25 Years of Progress in Petroleum Technology, Division of Petroleum Chemistry, American Chemical Society, Sept. 3-7, 1951.

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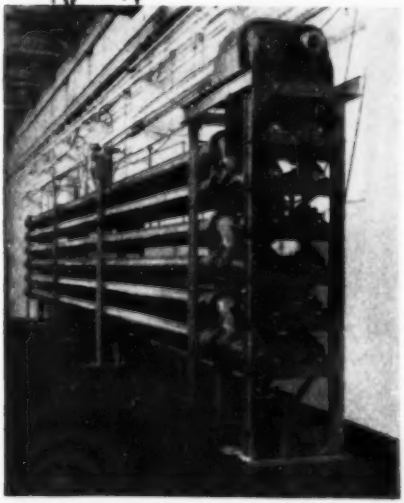

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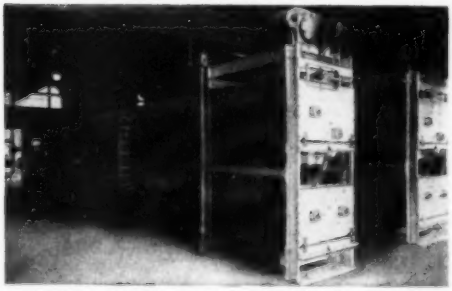

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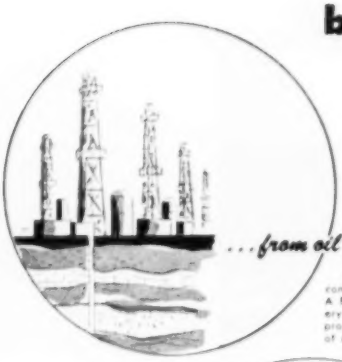


. . . from oil and gas fields

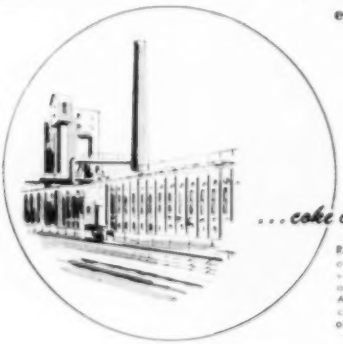
H_2S content of sour gas converted to elemental sulfur. A Foster Wheeler sulfur recovery plant in one location is producing over 300 tons/day of elemental sulfur.

The unprecedented demand for Sulfur has reached a point where the world's available supply is seriously threatened. Thus, the need to find new sources for this vital element becomes one of the major items on today's agenda for full-scale production for both defense and civilian needs.

. . . petroleum refineries

H_2S gases previously "flared" and the sulfur wasted, now recovered. Two Foster Wheeler sulfur recovery plants for this service now under construction.

Fortunately, there is a great new source. Instead of allowing it to vanish into thin air, Sulfur is being recovered profitably from H_2S bearing gases with Foster Wheeler equipment. A quarter million tons of Sulfur per year will be recovered by Foster Wheeler plants installed or now under construction.



. . . coke ovens

Removal of H_2S from coke oven gas not only enhances the value of the gas but provides a source of elemental sulfur. A Foster Wheeler sulfur recovery plant is in operation on this service.

FOSTER WHEELER

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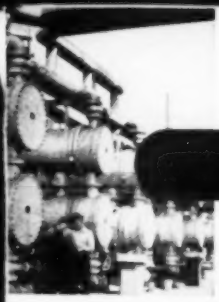

PLANT PRACTICES

Practical Tips and Ideas for Improving Operations

Flare Stack Design Whips Wind Problem

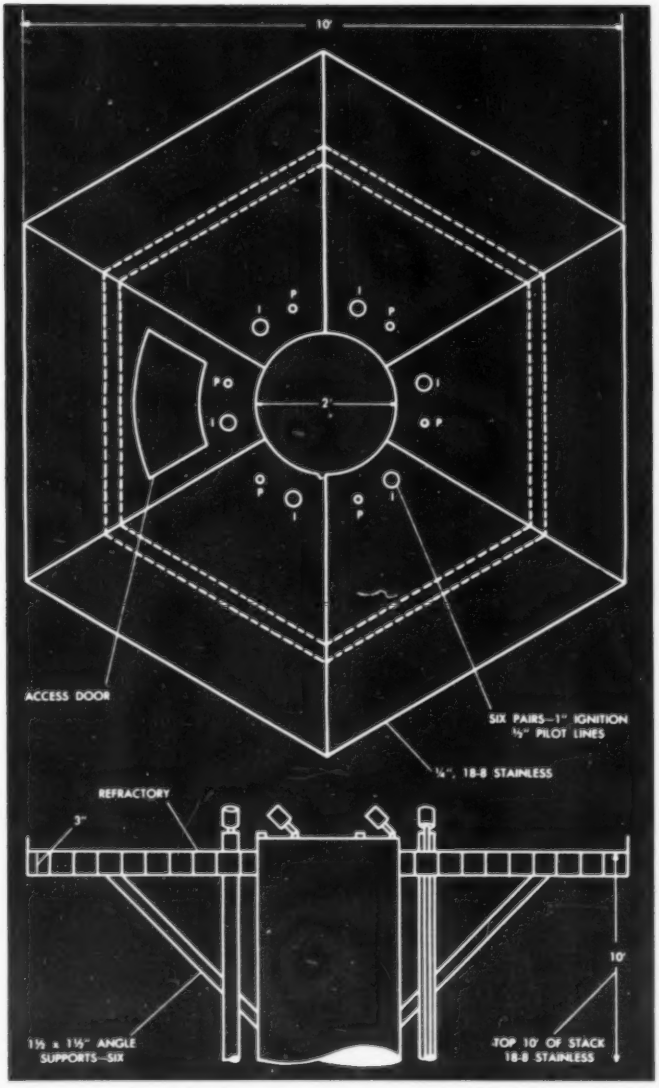

FIG. 1—NO BLOW-OUTS OF PILOT FLAMES because of weather conditions with this multiple-ignition flare stack tip

SALT Lake Refining Co.'s three year-old refinery, one of the newest in the country, is located about five miles north of Salt Lake City, Utah, at the western foot of a lofty mountain range and with absolutely nothing else higher than a decent-sized tree to the west, north, or south for miles and miles.

Consequently, high winds can come belting down from virtually any direction, including rebounds off the mountains, and can snuff out the refinery waste gas flare or make it extremely difficult to ignite. The flare stack is about 125 ft. high. The most satisfactory design as yet developed by Salt Lake's engineers to meet this problem is shown in the accompanying illustrations.

The most important feature is shown in Fig. 1—the use of six pairs of ignitor-pilot lines, mounted peripherally around and relatively close to the stack. Further, the pilot line is bent over so that the pilot burner is directly above the ignition line. By having the six pairs spaced evenly around the stack at 60° intervals, no matter which direction the wind blows, at least one—and perhaps two—pilot flames will reach the main gas flow from the stack.

All metal parts of the flare tip from a point 16 ft. below the top are made of 18-8 stainless steel. For added protection the hexagonal pan is lined with refractory brick.

The balance of the flaring system follows conventional design practice, and has not been shown in a drawing. It includes a knockout drum at the bottom of the stack and a surge, or separator, drum further back in the system, about 350 ft. from the stack.

The simple, but practical, ignition system is shown in Fig. 2 and in the photograph. It consists of a spark chamber made of a short length of 4-in. pipe, through which the air-refinery gas ignition mixture flows. Whenever it is necessary to ignite the pilots on the stack, the air and gas valves are set to fill the combustion chamber and the entire ignitor line with a combustible mixture. Then the spark plug, an ordinary automotive type, is energized and the flame front travels from the combustion chamber up the ignitor line to the pilots at the top of the stack.

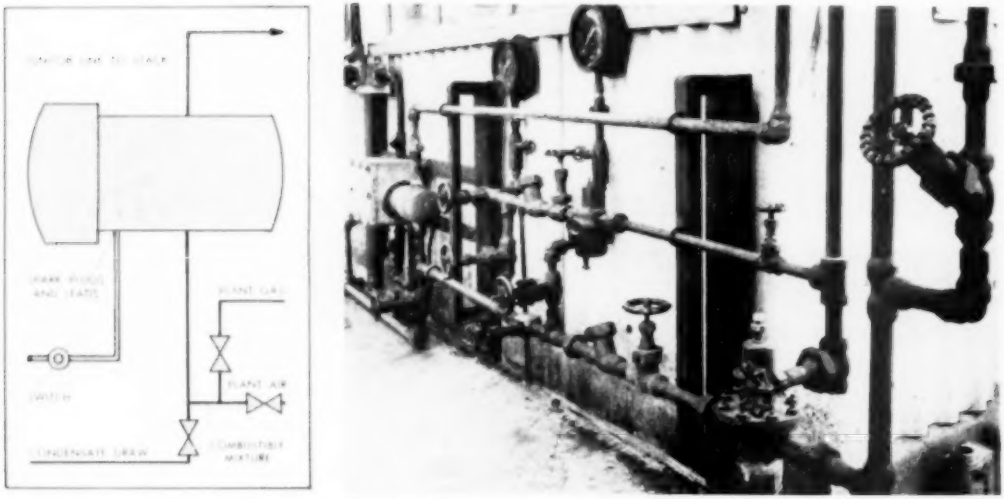

FIG. 2—Photo and drawing of details of ignition system

Because of varying composition of refinery gases, some experimenting is necessary to establish the right mixture for combustion. The operator can tell when he's getting ignition by feeling how hot the outgoing ignition line becomes and by the sound of the explosion in the line when the spark plug is energized. Under normally favorable weather conditions and with a good supply of dry refinery gas, ignition is very fast.

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Other Flare Stacks

The previous item, describing Salt Lake Refining Co.'s flare stack design, is the eighth such article on this problem brought to the readers of PETROLEUM PROCESSING. Other articles are:

"Smokeless Flare Stacks," by W. H. Smolen, (Esso Standard Oil Co.) Sept., 1951, pp. 978-82.

"Safe, Smokeless Combustion Features Waste Gas Burner at Sinclair Refinery," by William H. Decker, Sept., 1950, pp. 965-8.

"Ohio Oil's Flare Stack Igniters Have Look Box for Safety in Operation," Aug., 1950, pp. 851-3.

"Flare Tip Gives Long Service Life at Low Operating Cost," by W. S. Schellentrager and H. G. Briggs (Standard Oil Co.—Ohio), July, 1950, pp. 736-8.

"Reduced Hazards to Personnel Attained with Pure Oil's Flare Stack Igniter," by E. P. King and R. B. Paxton, June, 1950, pp. 635-6.

"Gulf Oil's Flare Stacks Are Designed to Solve Three Important Problems," May, 1950, pp. 511-4.

"No Open Flames or Sparks Produced by Safe Flare Stack Ignition Device," by W. A. McElhannon and O. L. Clevenger (Humble Oil & Refining Co.), April, 1950, pp. 397-8.

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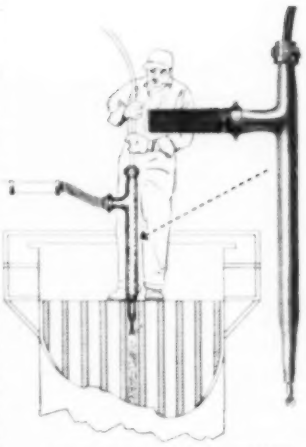

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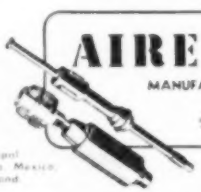

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358 (To obtain more data on advertised products see page 384)

Plant Practices

How to Improve Thermowell Life

By E. D. MATTIX and C. A. BRODINE*

THE feed lines to the reactor of a Fluid catalytic cracking unit contain oil vapors, steam and catalyst at a velocity of approximately 60 ft./sec. As the catalyst particle size ranges anywhere from 0 to 80 microns, you can see that these conditions present a serious problem in maintaining thermocouple wells in these lines.

A bare thermocouple well without a guard will last only 3 to 4 weeks. These thermocouples are the primary elements of the two temperature controllers by which the cracking reaction is controlled around 900° F. They position 30-in. slide control valves by controlling the flow of 1100° regenerated catalyst from the regenerator to the feed lines and thus to the reactor.

In crude oil refining, the operating units, until recent years, were off-stream quite frequently for clean-out, so the replacing of thermocouple wells and guards was just a matter of routine maintenance. Nowadays the cat crackers are setting records ons right after another for length of runs; consequently, some means had to be found to keep thermocouple wells in lines of severe service during the long runs.

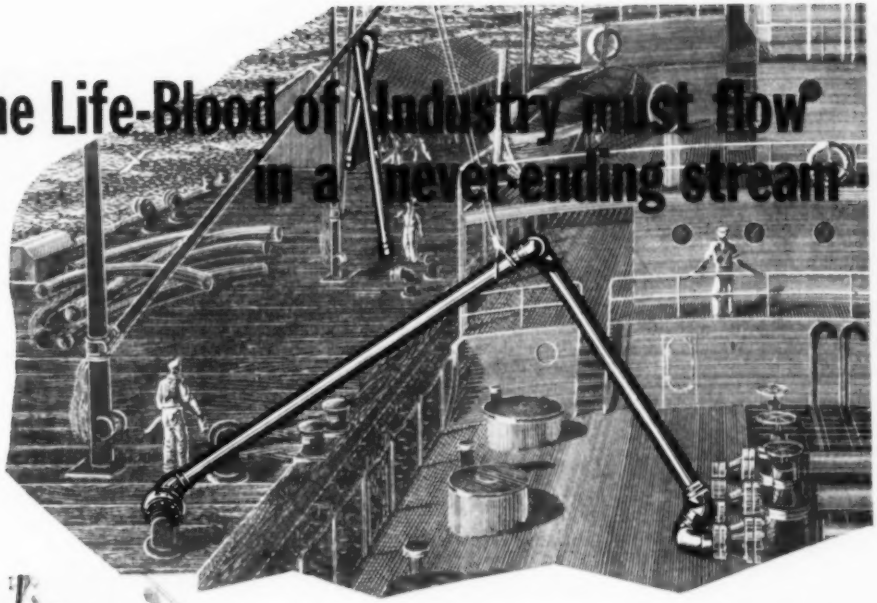
The thermocouple guards, which were 3-in. angle iron, were redesigned with the idea of breaking the catalyst flow as smoothly as possible, thus cutting down on the eroding effect. The point also had to be considered that if the guard was made too big, the thermocouple would be pocketed in a dead space and thus would lose its sensitivity to temperature changes. An iron wedge guard, $10\frac{1}{2}$ in. high, $2\frac{1}{4}$ in. wide and 8 in. long, was installed with the knife edge facing the flow 4 in. upstream of the thermowell. This was found to outwear all designs tried. Tests on alloy coating of these wedge guards are under way at present.

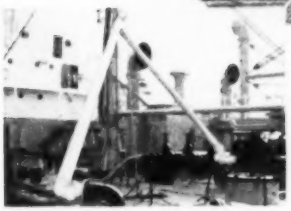
The long duration of the cat cracker runs made the aforementioned experiments very slow as it was sometimes well over a year before we could see the results of our ideas. So an additional means had to be employed to keep the thermocouples in these lines after the catalyst had eroded through both the guards and the well.

A removable thermocouple well assembly was devised, consisting of a $1\frac{1}{2}$-in. collar welded to the line to which was screwed a special $1\frac{1}{2}$ x

*Mr. Mattix is technical assistant to the operating superintendent and Mr. Brodine is instrument foreman, Cities Service Refining Corp., Lake Charles, La., refinery.

The Life-Blood of Industry must flow in a never-ending stream





Chiksan Marine & Barge All Metal Hose is not subject to kinking, crushing or cutting. This World renowned Metal Hose is not affected by severe climatic conditions or by petroleum products which often cause other hose to deteriorate rapidly. Thus Chiksan will outlast any other Hose used in these applications.

Chiksan Aluminum Marine & Barge Hose — facilitates Dock Side—to Ship Side connections by one man in a few moments. Speed, economy and safety are established factors where Chiksan equipment is used.

Chiksan Marine & Barge Hose and Chiksan Ball Bearing Swivel Joints can be supplied in any required length and size with end connections in either aluminum or steel for above-surface or underwater service.

When the Gatun Locks of the Panama Canal raise or lower their floating burdens of commerce and defense—when brine courses in uninterrupted flow to keep milk fresh and sweet—there you will find Chiksan Ball Bearing Swivel Joints speeding the life blood of industry—hastening the flow of progress.

Developed to conquer the rugged requirements of the World's Oil Fields, these joints have found application wherever gas, liquid or other fluid needs flexibility of material and direction, whenever Speed—Safety and Economy are essential to prosperity and growth.

Chiksan Ball Bearing Swivel Joints transform rigid ferrous metals, copper, brass or alloys into snaking tubes that have the elasticity-of-operation—the flexibility-of-function of rubber, and yet provide the safety factors and stoutness of heart that only well wrought metal can bring to industrial applications.

With Chiksan on the job, the torturing heat of steam cannot break through, nor can the relentless pound of exceedingly high pressure find escape.

Metal, heretofore unyielding, now twists and flexes to your will and to follow the plan and blueprint of industrial engineer. Each Chiksan Swivel Joint turns and twists like a living organism—speeds the flow of fluid and industry—of progress and defense.

Oil flowing in and out of a tanker—milk coursing its hygienic route from dairy to table—drill fighting its tortuous way through rock, shale and sand—coolant at the lathe and union of fire hose to truck—all know the live action—the flexibility and staunchness—the longevity and economy of Chiksan Ball Bearing Swivel Joints—connecting links in the Circulatory System of Industry, Defense and America in Action.

The Flow of Enterprise Relies on CHIKSAN Ball Bearing Swivel Joints

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(To obtain more data on advertised products see page 384)

4 in. nipple, a 1½-in. gate valve with a steam connection in both bonnet and bottom, a special 1½ barrel with 2-in. stuffing box on the outer end, and a steam connection on the vessel side of the packing, a packing gland, and a special 25-in. ball and socket thermocouple well without taper.

A ¾ in. cock was installed on the head end of the thermowell which could be closed if the well tip eroded away. The thermocouple well projected into the line 6 to 8". Because the barrel assembly is larger than this, it is possible to loosen the packing and pull out the well far enough to permit closing the 1½-in. gate valve before the eroded part of the well came into contact with the packing.

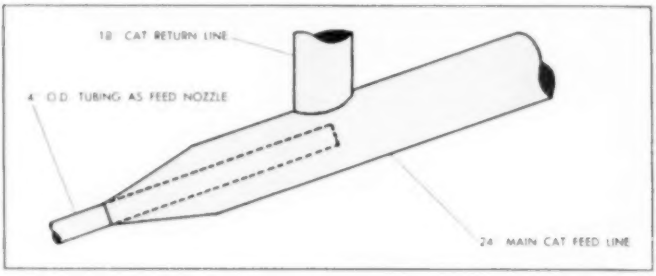
Since the reactor carries only 15 psig. pressure, the packing is always in contact with the good part of the well, and snuffing steam is used at three points on the assembly, this was found to be a very safe method of changing thermocouple wells during unit operation.

The above article is based on information contained in a paper "Refinery Control Problems," presented by Mr. Martin at the Instrument Conference, Houston, Texas, Sept. 10-14, 1951.

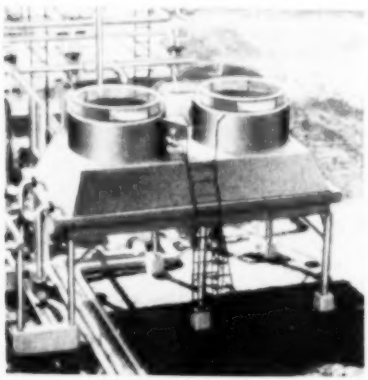
How to Feed Crude to Fluid Unit

THE accompanying sketch shows a simple arrangement worked out by Frontier Refining Co. at its Cheyenne, Wyo., refinery for including crude oil as feed stock for its Fluid catalytic cracking unit. A 4-in. O.D. tube carries the charge stocks into the feed leg at the junction point between regenerated catalyst and incoming gas.

No mixing chambers are used. Various feed lines are simply "Teed" in. Frontier's Fluid unit feed has averaged about as follows with this piping arrangement: gas oil, 1700 b.d.; recycle gas oil, 500 b.d.; fractionator bottoms, 250 b.d.; and crude oil, 1250 b.d. Occasionally it has been varied to take about 1500 b.d. of crude.



PIPING ARRANGEMENT for adding crude oil to feed stock being charged to Fluid cracking unit at Frontier's Cheyenne refinery



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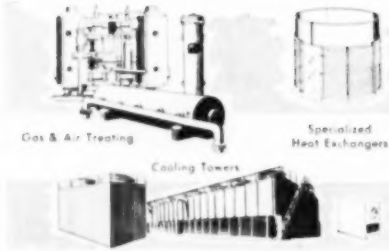

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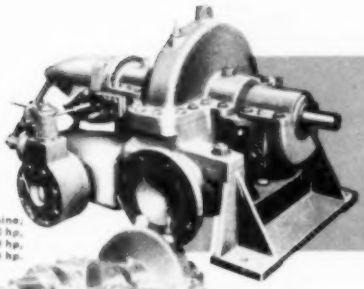
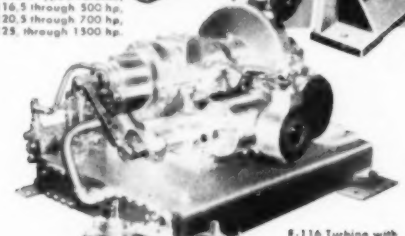
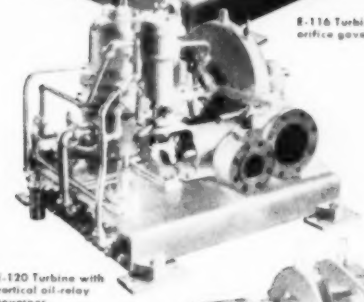


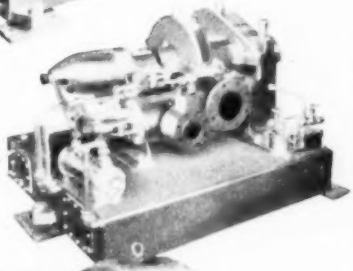
Standard Type E Turbine, E-116, 5 through 500 hp, E-120, 5 through 700 hp, E-125, through 1500 hp.



E-116 Turbine with orifice governor.

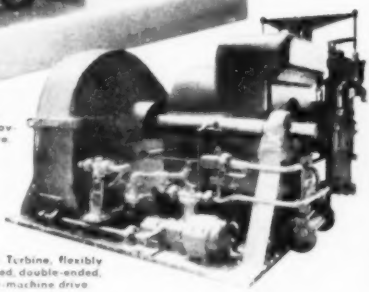


E-120 Turbine with vertical oil-relay governor.



E-116 Turbine, close-coupled gear; shaft governor.

E-120 Turbine, close-coupled gear; shaft governor—generator drive.



M-25 Turbine, flexibly coupled, double-ended, paper-machine drive.

Westinghouse General-Purpose Turbines can be supplied for mechanical or generator drive . . . either direct connected or geared . . . for condensing or noncondensing operation. This *complete* line . . . plus a nationwide staff of trained steam engineers, conveniently located sales offices, and service shops . . . assures you of the correct solution to *your* steam-drive application problem.

The single-stage Type E turbine, with designs for three basic classes of steam conditions, three wheel sizes and three standard governor types, provides in effect twenty-seven *standard, economical* variations to cover a wide range of applications. In addition, an almost limitless number of special applications can be met through the use of heavy-duty parts, and optional accessories.

Geared-turbine drives are offered either flexibly coupled to accommodate either right- or left-hand gear offsets, double-ended output shafts; or close-coupled (Gearturbines). Gearturbines are standardized on a single offset arrangement, affording utmost economy.

Other types in the complete Westinghouse general-purpose turbine line include heavy-duty and multi-stage units for applications requiring high temperatures and pressures, higher speeds, greater horsepower, extraction for process applications, or higher efficiency than may be had with single-stage machines.

The superiority of the Westinghouse line is the result of over 60-years' design, manufacture, and application experience. To get the benefit of this broad know-how, call your nearby Westinghouse office, or write Westinghouse Electric Corporation, P. O. Box 868, Pittsburgh 30, Pa.

J-50552

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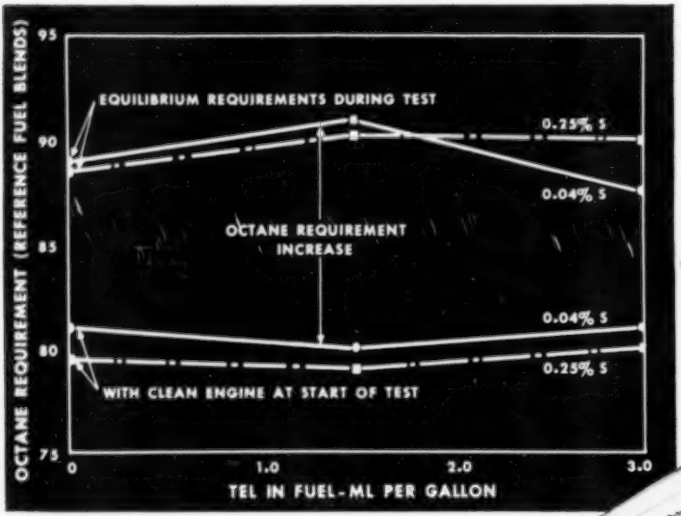
GENERAL-PURPOSE TURBINES



This chart shows the results of tests conducted as part of a program carried on at the Du Pont Petroleum Laboratory to determine the factors affecting octane requirement increase. The clean engine requirements at the start of each test and the equilibrium requirements observed are plotted as a function of the amount of tetraethyl lead used.

HOW DO ENGINE DEPOSITS AFFECT OCTANE REQUIREMENTS?

Du Pont Petroleum Research offers new findings

Deposits are generally admitted to be a contributing cause to engine knock. Since knock has long presented a problem to petroleum and automotive engineers, the results of Du Pont deposit studies in connection with knock may be of interest to you.

Data from these studies show, for example, that knocking tendency of the combustion chamber deposits is independent of the amount of both tetraethyl lead and sulfur present in commercial type fuels and lubricants. Fuels containing up to a 3.0 ml TEL per gallon were used in the tests.

The Du Pont Petroleum Laboratory also investigated the volume effect, the catalytic action and the thermal insulating effect of deposits on octane requirement. The results indicate that the effect of deposits in increasing knocking tendency is not primarily catalytic . . . but that the volume and thermal insulating effects of deposits both contribute to raising octane requirement.

As part of the work in helping refiners obtain knock-free fuel performance through the use of tetraethyl lead compounds, Du Pont has made the findings of these studies available in booklet form. Ask your Du Pont representative for a copy of "Possible Mechanisms By Which Combustion Chamber Deposits Accumulate and Influence Knock" . . . or write direct to the nearest district office.

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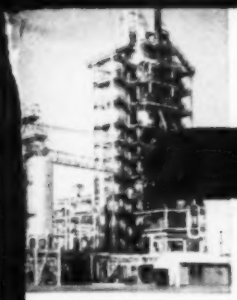
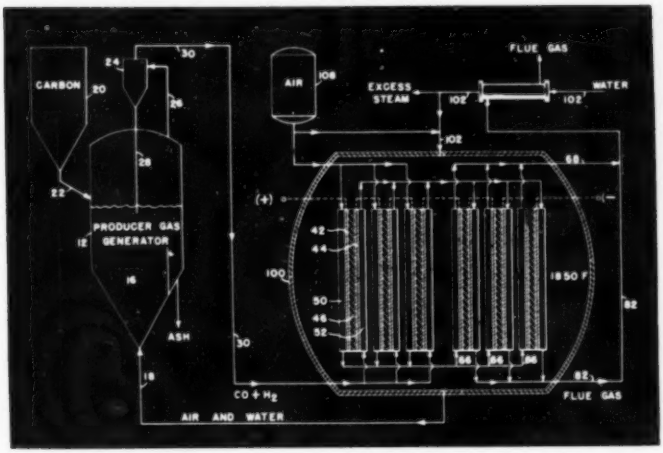


PROCESSING PATENTS

New Developments in Processes and Products

By PETER J. GAYLOR
Editor, "The Technical Survey"

Fuel Cell Converts Producer Gas Directly to Electrical Energy



FROM GAS TO COAL in one easy direct step is the aim of this fuel cell, developed by Pittsburgh Consolidation Coal Co. (U.S. 2,581,650)

EVERY now and then a method is proposed for converting fuels directly into electricity by means of a fuel cell. There is a possibility that such a method may prove practical within the near future and, since the country's leading coal producer is becoming active in this field, it would be desirable to acquaint our readers with some of the facts in this regard. Although coal is indicated as the possible fuel to be used, there is no reason why hydrocarbons, for example methane, would not be suitable.

In its U. S. patent 2,581,650, Pittsburgh Consolidation Coal Co. points out that, in prior fuel cells, the carbon monoxide and hydrogen are first generated in a separate gasification zone and then fed to the cathode end of the fuel cell. Accordingly, the overall efficiency of conversion of carbon to electric power in such systems, assuming that the maximum efficiency heretofore realized in each of the two separate steps is achieved, is of the order of 40%. The new process described in the patent is claimed to have an overall efficiency approaching 60%.

This process depends on the feeding of air into the anode chamber (of iron-magnetite), at high temperature, while reformed or producer gas (carbon monoxide and hydrogen) is fed through the cathode chamber (iron-iron oxide) which is separated from the anode by a high melting glass solid electrolyte. At the anode, electrons are picked up by the iron oxide to release oxide ion or its equivalent into the solid electrolyte. The oxygen from the air reacts with iron to maintain its state of oxidation, while at the cathode, oxide ion is discharged to release electrons and oxidize the electrode to a higher oxide of iron. The carbon monoxide and hydrogen circulating in the cathode reduce the higher oxide thus formed and are in turn converted into carbon dioxide and water. A portion of the energy, thus released by the combustion of the producer gas, generates electricity through the medium of the electrolyte.

The process may be more readily understood by reference to the flow sheet shown above. The carbon from vessel 20 is fed through line 22 into generator 12 into the bottom of which is introduced, through line 18, air and water, to induce the steam-carbon reaction in a fluidized bed of solids 16. Producer gas taken off through line 26, first passes through cyclone 24 and thence through line 30 into the cathode chambers 52 of the fuel cells which are encased in a gas tight tank 100 and are operating at 1850° F.

Air from tank 108 is fed into the anode chambers 50 of the fuel cells and, after recycling through another battery of cells via lines 66, the flue gas formed is discharged through line 68 where it joins the flue gas from the cathode chambers which is discharged through line 82. The cells are maintained at about 1850° F. in vessel 100 into which the air and water for the producer gas are fed and preheated for gasification purposes (through line 102).

The individual cells generate a voltage of 0.5-0.9 v. depending on the density of the current withdrawn from the cell. The remainder of the energy is released as heat. The high-melting glass electrolyte 46 separating anodes 42 and cathodes 44 consists of a mixture of sodium silicate, monazite sand, tungsten trioxide and sodium carbonate.

The patent mentions a prior patent 2,570,543 which describes a process giving efficiencies as high as 75% in converting carbon to electrical energy, but the present system apparently is a simpler one.

Use Thioether Compounds As Instrument Lubricants

ONE factor which is considered important in the lubrication of watches or other fine instruments is the creeping tendency of the oil. Ordinary mineral oils, when applied to a metal surface, gradually creep away from the point of application until only a film remains. Some synthetic materials like tricresyl phosphate will remain at the point of application, in the form of a small drop, for long periods of time without creeping away.

In its U. S. patent 2,552,510, Elgin National Watch Co. describes high molecular weight thioether compounds possessing desirable properties for instrument lubricating use. The lubricant preferably is in the form of a mixture of isomers or homologs whereby a low melting point is obtained. Seleno compounds also are suitable.

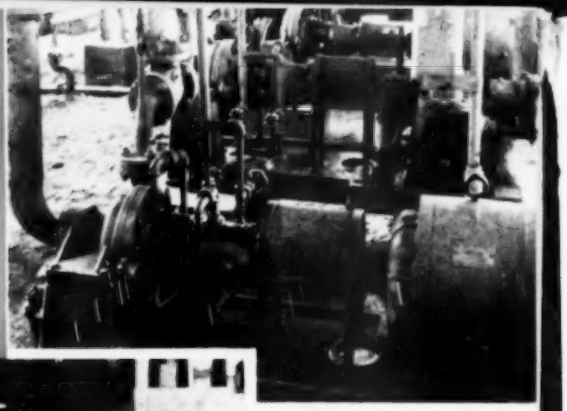
Among the compounds mentioned are diamyldithiodipropyl sulfide, boiling range 205-210°C/2mm., diamyldithiodipropyl selenide, a non-oxidizing red oil with 10.6 cs. viscosity at 100° F. and 53 at 32° F., etc.

A blend containing 100 parts by

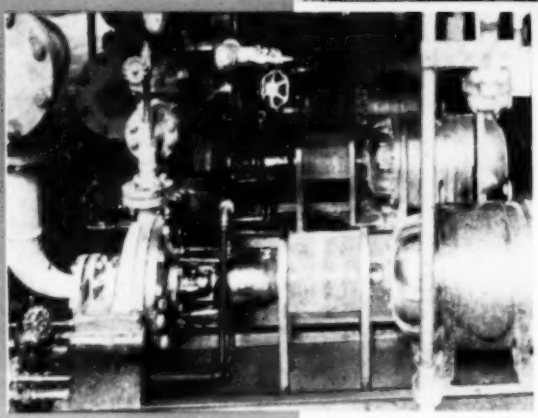
Pumping Jobs are Different...

but your maintenance inventories stay small, when you standardize on

Wilson-Snyder Type ES Process Pumps

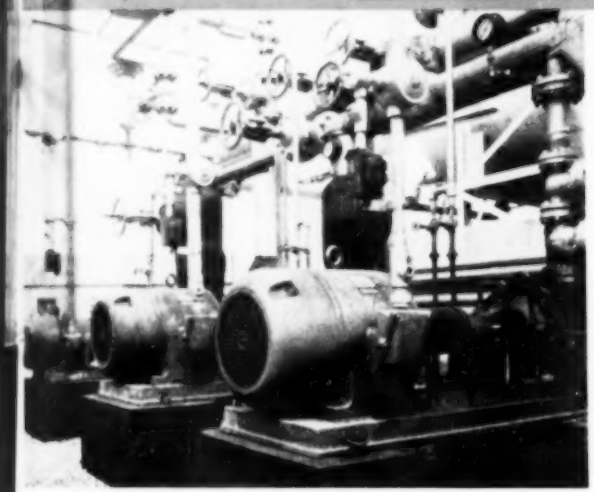


Three pumps are in the "Cat Cracker" feed preparation section. They handle gasoline with sp. gr. .742 at 100 F temperatures at differential pressures from 75 to 150 psi yet each pump capacity is 137 gpm.



These seven "product pumps" directly beneath the main "Cat Cracker" section handle hot oil at temperatures ranging from 400 F to 800 F. Pumps in the bank operate independently of each other and differential pressures range from 75 to 210 psi capacities from 100 to 535 gpm.

Three more pumps in service in the "Gas Recovery" section handle both gasoline with sp. gr. .651 and lighter and butane with sp. gr. .587 and lighter at the rate of 340 gpm and at some temperatures of 100°F. Differential pressures for different pumps range from 75 to 100 psi.



GREAT LAKES Refining Division of Petco Corporation near Chicago, Illinois, has thirteen Type ES Centrifugal Process Pumps in three distinctly different process service applications—each of which presents different operating conditions and calls for different combinations of capacities, differential heads, specific gravities, etc. The description by each picture tells the story.

But what the engineers of this refinery discovered was this: In addition to the broad capacity range at high efficiency and the extra long service life provided in the Type ES pump design . . . only three sizes of bearing brackets, sleeves, packings, shafts and bearings are required for servicing all 18 pump sizes in the line.

This enables refineries to standardize on these pumps for most types of operations where capacity ranges are from 40 to 1800 gpm, with differential heads from 40 to 1000 feet, with speeds ranging from 1750 to 4000 rpm and with horsepower ranges from 2 to 250. Extra savings result from the amazingly small inventory of maintenance supply parts required.

FOR FULL INFORMATION . . . or quotations on Wilson-Snyder Process Pumps, contact "Oilwell's" nearest refinery specialist at area office points shown at left.

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weight of diamyldithiodipropyl sulfide, 0.2 part of dodecylpiperidine stearate (as oiliness agent), and 1 part of polystyrene of about 20,000 molecular weight (as V.I. improver), has a viscosity of 12.8 cs. at 100° F. and 46.3 at 32° F., a cloud point of below −100° F. pour point of −100° F., showed very slight discoloration on brass, staining after 20 days on steel, and 2% evaporation loss after blowing at 70° C. for 100 hrs. with ½ cu. ft. of nitrogen per hour through 1 gram of sample.

Patents Issued in January

The following classified listing gives the patent number, patentee or assignee, and a brief description of all patents believed to be of interest to the petroleum processing industries, as contained in the Official Gazettes of the U. S. Patent Office for January 1, 8, 15, 22, and 29. Vol. 654, Nos. 1-5.

Chemicals

2,580,401 (M. W. Kellogg Co.) Separation of organic acids from alcohols.

2,580,100 (Standard Oil Development Co.) Method for starting up low-temperature iso-olefin polymerization.

2,580,022 (du Pont) Storage and concentration of acetylene.

2,580,730 (Metal & Thermit Corp.) Stabilized chlorinated paraffins.

2,581,014 (Socony-Vacuum Oil Co.) Process for methylation of aromatics.

2,581,050 (Aktiebolaget Centrallaboratorium Helsingborg) Method for the production of dimethyl sulfoxide by oxidation of dimethyl sulfide.

2,581,065 (Standard Oil Development Co.) Oxidation of diolefin hydrocarbons to phthalic anhydride.

2,581,092 (Standard Oil Development Co.) Olefin-diolefin copolymers and mercaptan adducts.

2,581,094 (Standard Oil Development Co.) Preparation of drying oils.

2,581,139 (Standard Oil Development Co.) Method for improving the quality of naphthenic acids.

2,581,147 (Standard Oil Development Co.) Low-temperature iso-olefin polymerization with aluminum chloride containing aluminum metal.

2,581,154 (Standard Oil Development Co.) Tertiarybutyl halide promoters in Friedel-Crafts catalyzed olefin polymerizations.

2,581,155 (Standard Oil Development Co.) Recovery of high-molecular weight polymers from hydrocarbon solutions.

2,581,398 (U. S. of America) Method for the separation of a methyl naphthalene from a methyl naphthalene by azeotropic distillation.

2,581,402 (Phillips Petroleum Co.) Stabilized redox compositions.

2,581,405 (Phillips Petroleum Co.) Purification of isoparaffins.

2,581,506 (Tide Water Associated Oil Co.) Treatment of oxidized hydrocarbons obtained by liquid phase oxidation.

2,581,514 (Standard Oil Co. (Ind.)) Production of monoolefinic acid derivatives.

2,581,760 (National Distillers Products Corp.) Azeotropic distillation of methanol and acetone with hexane.

2,582,016 (Phillips Petroleum Co.) Process for the production of acetylene.

2,582,264 (Shell Development Co.) Softening agent for rubber and resultant rubber composition.

2,582,278 (Phillips Petroleum Co.) Processing rubber.

2,582,411 (Universal Oil Products Co.) Olefin copolymers having drying properties.

2,582,425 (Universal Oil Products Co.) Tripolymer of a vinyl aromatic compound, a coumarone-indene fraction and material recovered from a hydrocarbon-catalyst sludge.

2,582,434 (Universal Oil Products Co.) Production of diisobutylene having improved drying characteristics.

2,582,541 (Standard Oil Development Co.) Polymerization of conjugated diolefins.

2,582,561 (Pure Oil Co.) Method for separating oxidation products.

2,582,750 (Phillips Petroleum Co.) Organic cobalt resinates as accelerators of vulcanization.

2,582,820 (Phillips Petroleum Co.) Production of rubber products.

2,582,961 (Socony-Vacuum Oil Co.) Alkenylsuccinic anhydrides and preparation therefor.

2,583,095 (Union Carbide and Carbon Corp.) Hydrocarbon-tin stabilizers.

2,583,271 (Phillips Petroleum Co.) Emulsion polymerization with a redox catalyst containing a trace fluorine.

2,583,300 (Ethyl Corp.) Tin olefin hydration.

2,583,310 (Shell Development Co.) Method of stabilizing diolefin-polymer-sulfur dioxide reaction products.

2,583,311 (Phillips Petroleum Co.) Preparation of sulfones.

2,583,312 (Standard Oil Development Co.) Extractive distillation of alcohols with phenol mixtures.

2,583,320 (Standard Oil Development Co.) Controlling rate of reaction by refluxing in the butadiene-dimethylfurene copolymerization.

2,583,326 (Phillips Petroleum Co.) Production of alcohols.

2,583,364 (Standard Oil Development Co.) Process for preparing isoolefin-diolefin copolymers of molecular weight 25,000 to 45,000 average molecular weight.

2,583,427 (Shell Development Co.) Stabilizing polyolefin sulfones.

2,583,572 (Universal Oil Products Co.) Separation of a Schiff's base from the condensation product of a primary amine with a carbonyl compound.

2,583,598 (Shell Development Co.) Unsaturated diesters of hydroxydicarboxylic acid and polymers thereof.

Catalysts

2,580,429 (Houdry et al.) Catalytic structure of silica on alumina-coated pebbles.

2,580,647 (Universal Oil Products Co.) Preparation of a phosphoric acid-carbon catalyst.

2,581,676 (Universal Oil Products Co.) Regeneration of fluidized catalyst.

2,582,060 (National Aluminate Corp.) Preparation of silica-magnesia bead catalyst.

2,582,254 (Standard Oil Development Co.) Treatment of silica-alumina containing gels.

2,582,428 (Universal Oil Products Co.) Preparation of alumina platinum halogen catalyst.

2,582,722 (Standard Oil Development Co.) Preparation of silica-alumina bead catalyst.

2,582,956 (Houdry Process Corp.) Activating clay by roasting with admixed acid salts.

2,582,976 (Anglo-Iranian Oil Co. Ltd.) Stabilized dehydrated montmorillonite catalyst.

2,583,452 (Standard Oil Development Co.) Manufacture of hollow magnetic bead catalyst.

2,583,815 (Standard Oil Co.-Ind.) Preparation of a Raney catalyst surface.

Lubricants

2,580,430 (The Standard Oil Co. (Ohio)) Catalyzed phosphorus sulfide-hydrocarbon reaction products and lubricants from same.

2,580,576 (Gulf Research & Development Co.) Smooth-textured lithium-base greases.

2,580,572 (The Texas Co.) Internal-combustion engine employing cooling oil for lubrication.

2,580,587 (Socony-Vacuum Oil Co.) Mineral oil composition containing a polymer(alkyl) metaphosphonate.

2,580,634 (Standard Oil Co.-Ind.) Grease dye petrolatum.

2,581,126 (Standard Oil Development Co.) Extreme pressure lubricating grease.

2,581,127 (Standard Oil Development Co.) High temperature lubricating grease.

2,581,132 (The Texas Co.) Soluble lubricating oil containing glycolidine compound.

2,582,285 (Standard-Vacuum Oil Co.) Fluorine-containing lubricant.

2,582,706 (Standard Oil Development Co.) Lubricating oil additives comprise organic acid-butadiene monoxide condensate.

2,582,853 (Sherwin-Williams Co.) Method for the preparation of aluminum and magnesium soaps.

2,582,956 (Pure Oil Co.) Detergent oil composition containing metal weed grease salt reacted with phosphorus sulfide.

2,583,200 (Elgin National Watch Co.) Non-spreading lubricant containing alkylaromatic polar compounds.

2,583,394 (Socony-Vacuum Oil Co.) Extreme pressure greases.

2,583,436 (Standard Oil Development Co.) Heavy-duty lubricating grease.

2,583,453 (Standard Oil Development Co.) High-temperature grease.

2,583,805 (Honorary Advisory Council for Scientific and Industrial Research) Solid-stabilized composition (oxygen-containing gel) for water lubricating grease containing polystyrene.

2,583,806 (Honorary Advisory Council for Scientific and Industrial Research) Lubricating grease containing water gel and organic-soluble polymer.

2,583,807 (Honorary Advisory Council for Scientific and Industrial Research) Silica-base lubricating grease containing linseed or modified linseed resin.

2,583,808 (Honorary Advisory Council for Scientific and Industrial Research) Silica-base lubricating greases containing organic-soluble polymer.

2,583,809 (Honorary Advisory Council for Scientific and Industrial Research) Complex soap greases containing dibasic carboxylic acid and wax.

2,584,041 (Nuodex Products Co.) Process of preparing oil-soluble metal soaps.

2,584,604 (Shell Development Co.) Lubricant containing inorganic gel and organo-boron polymer.

Conversions

2,580,478 (The Standard Oil Co. (Ohio)) Combination process for the catalytic hydrodesulfurization and reforming of hydrocarbon mixtures.

2,581,134 (Standard Oil Development Co.) Apparatus for contacting solids and gases.

2,581,163 (Pure Oil Co.) Promoting cracking reactions of hydrocarbons by the addition of organic peroxides.

2,582,947 (Phillips Petroleum Co.) Combination isoparaffin-olefin and aromatic-olefin alkylation process.

2,582,246 (Hydrocarbon Research, Inc.) Process for carrying out endothermic and exothermic reactions in fluidized systems.

2,582,710 (Standard Oil Development Co.) Fluidized method for conversion of carbonaceous solids into volatile products.

2,582,711-2 (Standard Oil Development Co.) Fluidized carbonization process.

2,583,239 (California Research Corp.) Catalytic isomerization of isoheptanes to triptane.

2,583,240 (California Research Corp.) Two-stage isomerization of n-heptane.

Hydrocarbon Synthesis

2,580,527 (Sulzer Freres Societe Anonyme) Method and absorption means for separating and for recovering carbon monoxide from gas mixtures.

2,581,318 (Standard Oil Development Co.) Method of controlling temperatures in a fluidized catalyst hydrocarbon synthesis process.

2,581,130 (Standard Oil Development Co.) Process for converting carbohydrates into bituminous substances.

2,581,712 (Ruhrchemie Aktiengesellschaft) Process of extracting oxygen compounds from hydrocarbon mixture.

2,582,713 (Standard Oil Development Co.) Regeneration of Fischer-Tropsch catalyst.

2,582,938 (The Texas Co.) Manufacture of synthesis gas.

2,583,134 (The Texas Co.) Catalytic synthesis of hydrocarbons.

2,583,164 (The Texas Co.) Production of synthetic hydrocarbons, oxygenated hydrocarbons and the like.

2,583,239 (Sinclair Refining Co.) Separation of carbon monoxide from gaseous mixtures.

2,583,254 (Phillips Petroleum Co.) Hydrocarbon synthesis catalyst.

2,583,255 (Phillips Petroleum Co.) Control of catalyst concentration in hydrocarbon synthesis.

2,583,611 (Hydrocarbon Research, Inc.) Method for the synthesis of hydrocarbons in the presence of a solid adsorbent.

2,583,620 (M. W. Kellogg Co.) Separation of organic compounds in hydrocarbon synthesis.

2,583,709 (Phillips Petroleum Co.) Solvent extraction of oxygenated organic compounds.

2,580,827 (Socony-Vacuum Oil Co.) Kiln for regenerating absorbents.

2,581,041 (Standard Oil Development Co.) Circulation of heat of finely divided solids.

2,581,054 (Standard Oil Development Co.) Method of operating liquid reflux systems in fractional distillation.

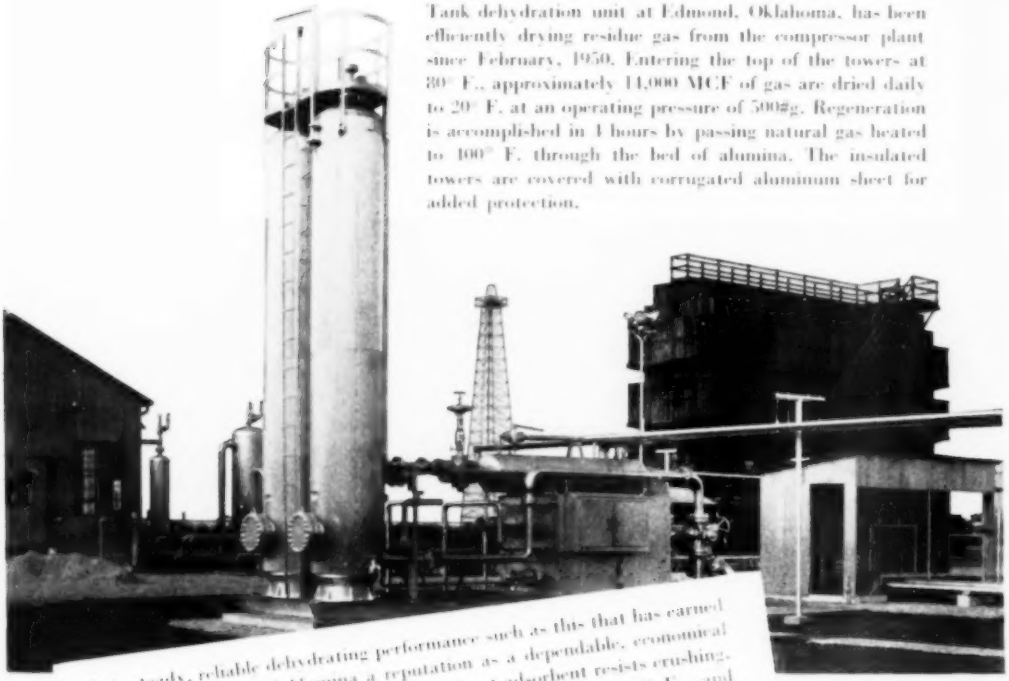
2,581,061 (Standard Oil Development Co.) Process for desulfurizing hydrocarbons with a mixture of ferric and chromic oxides.

2,581,064 (Standard Oil Development Co.) Treating oil with sulfur trioxide.

ALCOA Activated Alumina

dries 14,000 MCF of residue gas daily at West Edmond Hunton Lime Unit

Charged with ALCOA *Activated* Alumina, this National Tank dehydration unit at Edmond, Oklahoma, has been efficiently drying residue gas from the compressor plant since February, 1950. Entering the top of the towers at 80° F., approximately 14,000 MCF of gas are dried daily to 20° F. at an operating pressure of 500#g. Regeneration is accomplished in 4 hours by passing natural gas heated to 400° F. through the bed of alumina. The insulated towers are covered with corrugated aluminum sheet for added protection.



It is steady, reliable dehydrating performance such as this that has earned for ALCOA *Activated* Alumina a reputation as a dependable, economical desiccant. Commercially pure, this highly inert adsorbent resists crushing, shock and abrasion—dries to dew points as low as *minus* 100° F. and even lower. It will not swell, soften or disintegrate even when immersed in water . . . is non-corrosive and practically iron-free.

If you dry gases, vapors or organic liquids, you'll want *all* the facts regarding this outstanding drying agent. We'll gladly show you how it can solve *your* particular drying problem.

Write to: Aluminum Company of America, Chemicals Division, 0760 Gulf Building, Pittsburgh 19, Pennsylvania.

Alcoa Chemicals

ALCOA

ALUMINAS and FLUORIDES

ACTIVATED ALUMINAS • CALCINED ALUMINAS • HYDRATED ALUMINAS • TABULAR ALUMINAS • LOW SODA ALUMINAS ALUMINUM FLUORIDE • SODIUM FLUORIDE • SODIUM ACID FLUORIDE • FLUOBORIC ACID • CRYOLITE • GALLIUM

"SEE IT NOW" with Edward R. Murrow, brings the world to your armchair . . . CBS-TV every Sunday—3:30 P.M.—E.S.T.

Processing Patents

2,581,065 (Standard Oil Development Co.) Method of purifying isobutylene by sulfuric acid extraction.

2,581,068 (Standard Oil Development Co.) Fractionation of gaseous mixtures.

2,581,102 (Standard Oil Development Co.) Removal of oxygenated organic compounds from synthesis hydrocarbons.

2,581,117 (Standard Oil Development Co.) Treatment of cracked naphthas with a hypochlorite followed by an alkali sulfide.

2,581,135 (Standard Oil Development Co.) Process for the removal of oxidizable sulfur compounds from a hydrocarbon gas mixture using oxygen in fluidized system.

2,581,344 (Koppers Co., Inc.) Purification of distilled coke-oven benzene by distillation with added hydrocarbon material.

2,581,360 (Standard Oil Co.-Ind.) Refining of synthetic hydrocarbon mixtures by passing over silica-alumina.

2,581,373 (Sonny-Vacuum Oil Co.) Method for separating waxy and oily materials.

2,582,148 (J. F. Pritchard & Co.) Method of recovering desirable saponifiable hydrocarbons.

2,582,197 (California Research Corp.) Solvent extraction process with perfluorocarbon.

2,582,415 (California Research Corp.) Adsorption process for the separation of hydrocarbons.

2,582,443 (Universal Oil Products Co.) Process for separation of ethane from C_2 hydrocarbons containing acetylene.

2,582,883 (Socony-Vacuum Oil Co.) Modified double solvent treatment (phenol-propane-organic carbonate).

2,583,013 (Standard Oil Development Co.) Condensation of sublimable material.

2,583,065 (Pure Oil Co.) Oxidation of mercaptans with oxygen in presence of butyl hydroquinone.

2,583,080 (Elliott Co.) Separation of natural gas mixtures.

2,583,136 (Pure Oil Co.) Regenerating mercaptan-containing caustic with oxygen and anthranol.

2,583,302 (Union Oil Co.) Adsorption process.

2,583,504 (C. S. of America) Method for the separation of a-methyl naphthalene from b-methyl naphthalene by azeotropic distillation.

2,580,651 (Universal Oil Products Co.) Fractionation control.

Fuels

2,580,766-7 (American Gas Assn.) Process for manufacturing oil gas.

2,581,441 (Glenn L. Martin Co.) Solidified nitrocellulose hydrocarbon and process for producing same.

2,581,458 (L. D. Thompson) Method and apparatus for operating internal-combustion engines on composite mixtures of Diesel fuel oil and gasoline.

2,582,192 (California Research Corp.) Diesel fuel oil.

2,583,518 (California Research Corp.) Diesel fuel containing sulfur and wear-inhibiting agent.

Specialties

2,580,966 (Monsanto Chemical Co.) Wax compositions containing alkylated polystyrene.

2,581,129 (Standard Oil Development Co.) Rust inhibiting composition containing fatty alcohol partial ester.

2,581,665 (The Texas Co.) Impregnation of absorbent material with asphalt.

2,582,067 (Crown Zellerbach Corp.) Coating composition containing polyethylene and wax and paper coated therewith.

2,582,733 (Standard Oil Development Co.) Metal protecting compositions containing hethylamine petroleum sulfonate.

2,582,825-4 (Shell Development Co.) Asphalt composition containing amine salt adhesion agent.

2,582,870 (Socony-Vacuum Oil Co.) Water-repellent textile fabrics containing copper salt for resistance to fungi and bacteria.

2,583,425 (Standard Oil Development Co.) Fungicidal compositions containing chlorinated naphthols.

2,583,506 (Socony-Vacuum Oil Co.) Resin solvents containing nitriles.

2,583,586-12 (C. Mueller) Less inflammable hydraulic fluid containing fluoropolymer.

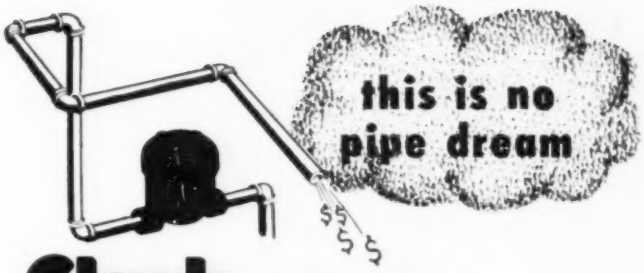
2,583,938 (Standard Oil Co.-Ind.) Method of preparing stable aerated (sponge) wax compositions and articles.

2,584,086 (Shell Development Co.) Ethylene glycol hydraulic fluid composition.

Miscellaneous

2,581,650-1 (Pittsburgh Consolidation Coal Co.) Method of converting carbon to electrical energy.

2,582,434 (Standard Oil Development Co.) Pressure filtration of LPG, etc.



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If dollars are running through your steam lines it's time Clark Controls took over. Water in steam lines wastes fuel, cuts efficiency and adds greatly to maintenance costs.

Clark Steam Traps, with Duo-Stop Leverage, drain *twice* the condensate of ordinary traps. Clark Controls on your lines is truly like money in the bank. Write us for full details.

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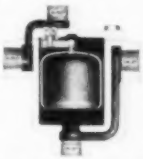
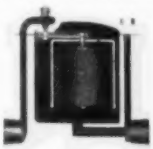
Remove dirt, scale and grit from steam, fluid and gas lines. Sizes ½" to 3" P.S.I.



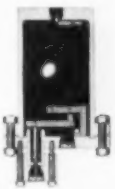


SERIES "70" Inverted Bucket Trap

One of the most popular in the Clark line. Continuous flow capacities up to 2600 lbs. per hour. Sizes ½", ¾" and 1". Pressures up to 200 P.S.I.

SERIES "60" Inverted Bucket Trap

Choice of horizontal or vertical inlet or outlet. For pressures up to 150 P.S.I. "Clark-loy" guided disc and seat.



SERIES "450"

For continuous flow drainage. Pressures up to 600 P.S.I. Sizes ½" to 2". External discharge valve; "Clark-loy" disc and seat.

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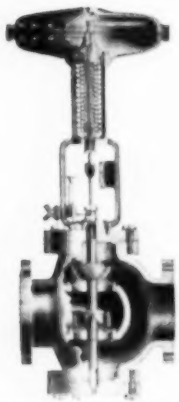
(To obtain more data on advertised products see page 384)

76 BS&B CLIMAX CONTROLS CENTERS



CLIMAX TYPE 86

Diaphragm Control Valve. One of the most widely used controls in the Climax line.

Your Fastest, Most Efficient Service

In 29 states and 3 Canadian provinces 76 BS&B Climax Controls sales and service centers are prepared to meet your needs for fast, efficient, convenient service on automatic controls for regulating flow, levels, temperature, pressure and power. From these centers, including 43 strategically located warehouse stocks of Climax Controls and parts, Climax sales engineers are quickly available to render service on existing equipment or to help you plan new installations.

The widespread, closely integrated Climax organization is a definite assurance that your machinery and processes will function at maximum efficiency and with minimum interruptions when equipped with BS&B automatic Climax Controls.

Climax Controls catalog will be sent to you promptly at your request.

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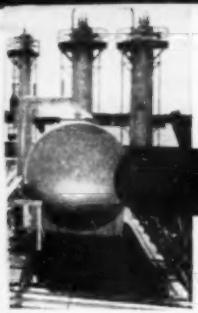
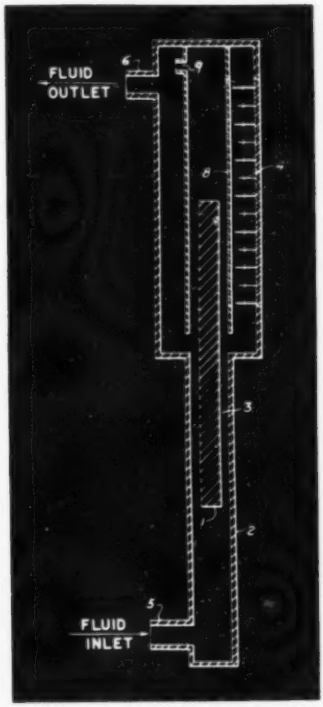


EQUIPMENT PATENTS

Brief Reviews of New Inventions in Equipment

Orifice Length Meters Flow



CONSTANT AREA and differential pressure: orifice length indicates flow

MOST flowmeters of the orifice-differential pressure type fall into two general classifications. One operates on the principle of using a constant area orifice, in which the flow rate is a function of and is indicated by the pressure drop across the orifice. The other maintains a constant pressure drop and indicates flow rate by change in orifice area; i.e., the variable-area, or "rotameter" type.

A third possibility which suggests itself—keeping the orifice area and differential pressure both constant, and measuring flow rate by variations in the *length* of the orifice has been developed recently. A schematic diagram is shown in the accompanying sketch. Construction is very simple since it utilizes an orifice and plug of simple cylindrical cross section and translates directly linear movement into flow measurement.

In operation, fluid to be measured enters at inlet 5, travels up through tube 2, passing through the annular space between the walls of tube 2 and the movable plug 1, and thence out through port 6. Annular space 3 is relatively small. Results are found more favorable when characteristics of viscous rather than turbulent flow are maintained. To reduce turbulence, a buffer zone is provided by inner tube 8, of the same diameter as tube 2 and with a leak port 9 at the upper end.

One type of indicator that can be employed is shown as a transparent window 4. With this type, tube 8 must also be provided with a window. However, materials of construction of the meter can be determined by the nature of the fluid to be handled.

Sensitivity and range of the instrument can be varied depending upon the dimensions and weight of plug 1 and its surface condition, the size of annular space 3, and the diameter of tube 4. The meter has been tested with water and such gases as acetylene and natural gas.

U. S. 2,581,588, issued January 8, 1952, to David H. Greene, assignor to Danciger Oil & Refining Co., Ft. Worth, Texas.

Leak Detector Design Uses Wheatstone Bridge Circuit

A SIMPLE, safe, electrical thermal conductivity device has been developed for detecting leaks, for example, those in furnace walls. It is said it can test for leaks of all kinds of gases without danger of igniting them.

This is made possibe by employing a Wheatstone bridge circuit in which one element is sensitive to small changes in temperature. This element is placed in an elongated tube which is provided with an exploring nozzle at one end and adjustable orifice at the other end. Small gas flows through the tube, caused by leaks, will effect a temperature change in the sensitive element and thereby effect an unbalance of the Wheatstone bridge. Current flowing in the bridge circuit can be indicated by a sensitive ammeter or galvanometer.

Sensitivity of the detector can be regulated in two ways. One is to adjust the needle valve on the small orifice to regulate the amount of gases circulating through the detector tube. Another way is to vary the power on the side of the bridge circuit opposite that of the sensitizing element, and can be done by an adjustable resistance.

U. S. 2,582,859, issued January 15, 1952, to Olin Centofanti, assignor to Socony-Vacuum Oil Co., Inc.

Patents Issued in January

The following classified listing covers patents issued during the month of January believed to be of value or interest to petroleum processing or handling operations:

Catalytic Reactors

2,580,470 (Houdry Process Corp.)—Fixed bed type conversion vessel.

2,581,134 (Standard Oil Development Co.)—Unit for contacting solids and gases in a fluidized bed.

2,583,110 (Celanese Corp. of America)—Reactor for continuous catalytic conversion of organic compounds and gaseous reactants.

Processing, general

2,580,827 (Socony-Vacuum Oil Co.)—Kiln for regenerating powdered absorbents such as have been used in treating oils, as in contact filtration.

2,582,068 (Elliott Co.)—Apparatus and method for separating gases by refrigeration and liquefaction under pressure.

2,582,116 (Phillips Petroleum Co.)—Pebble heater chamber design.

2,582,857 (Herbert Edward Serner)—Bubble tower.

2,582,884 (Standard Oil Development Co.)—Contacting tower construction.

2,582,826 (Glitsch Engrg. Co.)—Tray for use in refining towers.

2,582,903 (Aktiengesellschaft Brown, Boveri & Cie., Baden, Switzerland)—Device for producing chemical reactions in a flowing gas by electrical means.

2,583,561 (Blaw-Knox Co.)—Apparatus for supplying and distributing liquids.

Valves & Fittings

2,580,595 (George E. Renfro)—Line blind fitting of the L or T type.

2,580,626 (Chicksan Co.)—Fluid handling swivel joint.

2,580,866 (Russell R. Waterman)—Fuel regulating and safety shutoff valve, for boiler burners.

2,581,748 (Bowser, Inc.)—Fluid flow control valve, particularly for limiting flow through an hydraulic device or instrument such as a meter.

2,582,091 (Grove Regulator Co.)—Diaphragm-actuated fluid control unit.

2,582,439 (Shell Development Co.)—Automatic oil storage tank shutoff valve.

2,582,995 (Milton P. Laurent)—Plug and joint structure for sealing pressure vessels.

2,582,996 (Milton P. Laurent)—Seal for gate valve bonnets.

2,582,997 (Milton P. Laurent)—Closure assembly for openings in return bends, piping or pressure vessels.

2,583,215 (Continental Supply Co., Inc.)—Fluid pressure surge device.

ORBIT VALVES®

Friction Free Seating

Forged Steel
OIL COUNTRY RATED

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The design and construction of **ORBIT** Production, Flow Line and L. P. Gas Valves provide a maximum of ease of operation and simplicity of maintenance and service.

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ASA CLASS FOR LP GAS SERVICE

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It is not necessary to tighten **ORBIT VALVES** to the extreme to obtain positive closure, due to their unique seating principle. **ORBIT VALVES** are probably the easiest valve to care for and maintain of any valve on the market today, that has been designed for similar services.

—There IS ONLY ONE Orbit—

AVAILABLE AT YOUR SUPPLY STORES

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CASPER, WYOMING
LeRay Mitchell, Distributor
(Serving the Rocky Mountain States and Canada)

ODESSA, TEXAS
Starr Warehouse
(Serving West Texas)

Equipment Patents

2,583,512 (W-K-M Co.)—Gate valve.
2,584,083 (Socony-Vacuum Oil Co., Inc.)—Gate valve.

Tanks & Vessels

2,580,547 (Joseph D. Holbrook)—Self-cleaning gas safety tank.
2,583,536 (Chicago Bridge & Iron Co.)—Expansible storage tank.
2,583,592 (Chicago Bridge & Iron Co.)—Jointed ladder for floating roof tank.
2,583,981 (John H. Wiggins)—Dry seal pressure type gas holder.

Pumps & Compressors

2,580,649 (Union Carbide & Carbon Corp.)—Liquefied gas discharge pump.
2,581,055 (W. H. Martin)—Centrifugal pump.
2,581,160 (Harold B. Adams and Maurice C. Peters)—Variable volume rotary pump.
2,581,828 (Nash Engrg. Co.)—Vertical, centrifugal pump.
2,581,902 (Albert G. Bodine, Jr.)—Resonant gas compressor and method employing sonic principles for creating pressure.
2,583,231 (Standard Oil Development Co.)—Pulsation dampener, adapted for suppressing pulsations in outlet line of a reciprocating pump.
2,583,572 (Vanton Pump Co.)—Rotary pump.

Instruments

2,580,759 (Minneapolis-Honeywell Regulator Co.)—Liquid level responsive switch.
2,581,588 (Daneiger Oil & Refining Co.)—Flow meter with constant orifice area and differential pressure, but with variable orifice length.
2,581,812 (Carl M. Page)—Flammable gas detector.
2,582,150 (Regents of the University of Minnesota)—Mass spectrometer.
2,582,216 (Philips Laboratories, Inc.)—Mass spectrometer.
2,582,859 (Socony-Vacuum Oil Co., Inc.)—Gas leakdetector, particularly for testing furnace walls.
2,583,066 (Rockwell Mfg. Co.)—Fluid pressure regulator.
2,583,177 (Universal Oil Products Co.)—Equipment for obtaining an aliquot portion or portions of a fluid stream for sampling purposes for analysis.
2,583,221 (A. C. Parsons & Co. Ltd., Newcastle-on-Tyne, England)—Infrared gas analyzer.
2,583,541 (Consolidated Engrg. Corp.)—Mass spectrometer sample inlet system.
2,583,724 (Socony-Vacuum Oil Co., Inc.)—Magnetic flowmeter.
2,583,814 (Pirmall Ltd., Yate, near Bristol, England)—Differential manometer.
2,583,930 (Factory Mutual Research Corp.)—Thermal conductivity type gas analyzer and smoke detector.
2,583,941 (Thurlow M. Gordon, Jr.)—Electromagnetic device for detecting variables in fluid pressure.
2,583,973 (American Cyanamid Co.)—Differential refractometer.

Laboratory Equipment

2,581,807 (Erhard K. Mettler and Johann Meier, Zurich, Switzerland)—Analytic balance of the micro type.
2,582,960 (Howard L. Dinsmore)—Glass condenser, to improve on metal type presently used in ASTM assembly for extraction and solution of rubbers, tars, bituminous materials, etc.
2,583,421 (Sinclair Research Laboratories, Inc.)—Pump used in study of gas reactions at constant pressures—atmospheric or above or below.
2,583,906 (Precision Scientific Co.)—Constant temperature bath cabinet.

Seals & Gaskets

2,582,671 (The Falk Corp.)—Vertical shaft seal.
2,583,777 (Durlon Co.)—Shaft seal.
2,583,867 (Rotary Seal Co.)—Shaft seal.

How to Obtain Patents

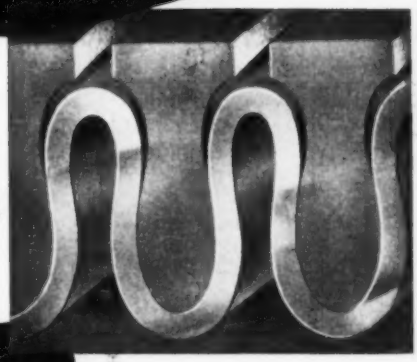
Readers may obtain copies of any U. S. patent from the Patent Office at 25 cents each. Order by patent number direct from The Commissioner of Patents, Washington 25, D. C.

a *Basic Principle* for protection

developed to ultimate efficiency

in

Badger Expansion Joints



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Self-Equalizing . . .
exclusive features of
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In combination with the correspondingly shaped Badger Self-Equalizing ring, progressively controlled movement of *each* corrugation insures a more flexible, longer lasting joint. Buy Badger Joints and you get flexibility, Directed-Flexing *Self*-Equalizing and these features:

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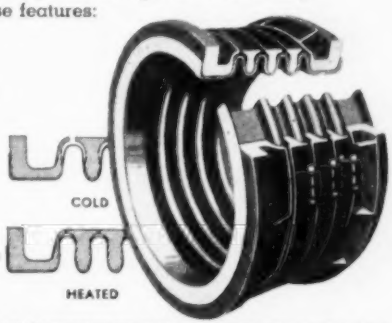
- Compact . . . approximately the size of flanged fitting
- Special forming . . . no structure-weakening stresses
- Controlled heat treating . . . assures long life
- Wide range of traverse — pressure — temperature Fabricated from deoxidized copper, stainless steel and special alloys to meet various operating conditions.



BADGER MANUFACTURING COMPANY

230 BENT STREET • CAMBRIDGE • MASS.

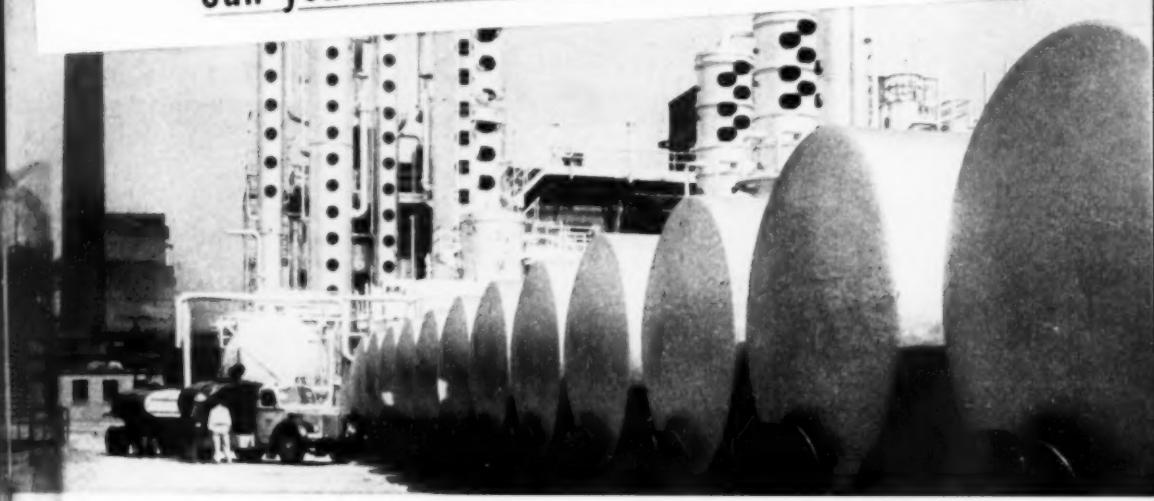
(To obtain more data on advertised products see page 384)

DOWELL SERVICE

CHEMISTRY APPLIED TO MAINTENANCE CLEANING PROBLEMS

This Chemical Company asked:

"Can you restore tower operating efficiency?"



Dowell Service restored original capacity IN ONE DAY!

A fractionating bubble-cap tower, operated by a southern chemical company, contained heavy deposits of iron sulfides, oxides and organic material. These deposits covered the trays and clogged the bubble-caps reducing capacity from 800 to 500 gallons per minute. *Fast, efficient* Dowell Service cleaned this tower in one day. Result: tower was restored to its original 800 g.p.m. capacity.

Dowell Service methods can be applied to many different kinds of refinery and chemical equipment *without dismantling and with a minimum of downtime!* Special liquid solvents designed to dissolve and disintegrate the deposits are pumped or sprayed into the equipment. No special scaffolding is required. Specially designed truck-mounted tanks, pumps, heaters, mixers and control equipment necessary to do the job properly are brought right into your plant.

What is *your* cleaning problem? Dowell Service has extensive experience in cleaning towers, cooling systems, heat exchangers, steam generating equipment, condensers, pipe lines, cooling jackets and many other types of industrial equipment. Call upon Dowell experience and equipment to help increase production. Dowell engineers will be glad to give FREE consultation. Phone the nearest Dowell office.

Other recent Dowell jobs:

All exchangers and towers in a southwestern chemical plant were cleaned by Dowell Service during a complete plant turnaround. Result: Plant turnaround time was cut from fifteen to six days.

•

Over 11,000 feet of 10 to 16-inch diameter fresh water service lines in an oil refinery were cleaned by Dowell Service. Result: Water lines were restored to designed capacity.

•

The Slurry-to-Feed heat exchangers in a fluid catalytic cracker were Dowell Serviced. Result: Company was able to increase through-put from 16,000 to 22,000 bbls. per day.

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Wilmington 99	Kansas City 8	Louisville	Beaumont, Texas
Richmond 19	Wichita 2	Upper Montclair, N. J.	Borger, Texas
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Cleveland 13	New Orleans 12	Lafayette, La.	Hobbs, N. Mex.

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The latest developments in air conditioning, lighting systems, and exceptional qualities of sound and thermal insulations are featured in Fluor Corp.'s new engineering and drafting offices at 2500 Atlantic Ave., East Los Angeles. The newly-constructed building contains a total of 9,600 sq. ft. of floor area, comprising two stories and a full basement.

On April 4, in Houston, Fluor will open another new building and will elevate the former Mid-Continent Gas-Gasoline department to the status of a division. Manager Ernest Moncrief has been appointed vice president in charge of the newly-created division. The building contains 15,000 sq. ft. of floor space.

Union Carbide Elects Director

Dr. Curme, Jr.

Dr. George O. Curme, Jr., has been elected a director of Union Carbide and Carbon Corp., to succeed the late James A. Rafferty, vice president and director.

In this new position, Dr. Curme will be in charge of all research activities of the corporation. He has been a leader in the field of chemistry for many years, and is a pioneer in the field of petrochemicals. He was elected a Fellow of the New York Academy of Sciences in 1950.

Select Handy Industrial Location

A combined regional office and warehouse has just been established at New Orleans by the Cooper-Bessemer Corp. Operating under the direction of Mr. T. E. Kraner, branch manager, Cooper-Bessemer's new district facilities now provide direct factory representation for all engineering service requirements on engine and compressor applications. In addition, the new warehouse stocks essential parts for servicing marine and industrial installations currently operating in the Southern Gulf Coast area. Working directly with Mr. Kraner is Mr. F. A. Gehres, assistant branch manager. Located at 1410 So. Jefferson Davis Parkway, the new site gives quick access to principal industrial and shipbuilding areas.

Fluor Makes Changes

J. S. Fluor was elected president of the Fluor Corp., Ltd., Los Angeles engineering and construction firm, succeeding D. W. Darnell.

Mr. Darnell was named chairman of the board, replacing Shirley E. Meserve, senior partner of Meserve, Mumper and Hughes, who will continue as chief counsel and board member.

J. Robert Fluor was named executive vice president, succeeding J. S. Fluor. James P. Wiseman, vice president, and Francis E. Fischer, secretary-treasurer, were re-elected to their posts.

The new president is the son of J. Simon Fluor, the firm's founder. He joined the company in 1921, was named assistant general manager and vice president in 1929 and executive vice president in 1944.

Babcock & Wilcox Erecting Plant

Construction has started on a Babcock & Wilcox Co. plant at Paris, Tex. This is the third new plant to be announced by the company within a year. When it gets into operation this summer the plant will employ 750 men, and will manufacture components for large utility and industrial boilers.

Total area under roof in the plant will be 135,000 sq. ft. composed of three bays, 500 ft by 90 ft. In addition there will be 1500 ft. of uncovered craneway.

Ethyl Veeps Elected To Board

Joseph A. Costello, B. Bynum Turner, and Sanford M. Wagner, all vice presidents of the Ethyl Corp., have been elected to the company's board of directors.

Mr. Costello, who is responsible for the coordination and planning of the corporation's activities, has been associated with Ethyl since 1928. He served in various management capacities in both sales and manufacturing departments for most of this period, and was elected a vice president in December 1949. A native of Pennsylvania, he is a graduate of Pennsylvania State College.

Mr. Costello

Mr. Turner

Mr. Wagner

Mr. Turner, who is vice president in charge of research and engineering, joined Ethyl in 1946. He was

named general manager of manufacturing in 1950, and in June 1951, was elected a vice president. Mr. Turner is a graduate of Rice Institute.

Mr. Wagner, vice president in charge of sales, joined the corporation in 1926. He was largely responsible for the introduction of "Ethyl" gasoline on the West Coast. Mr. Wagner was elected a vice president in January 1950. He is a graduate of Rensselaer Polytechnic Institute.

Pump Specialist Named

Roy F. Brisbois has been appointed process pump specialist for the Peerless Pump Division, Food Machinery and Chemical Corp. He is to devote his time to pump application problems in refineries, chemical process and industrial plants, coordinating his efforts with Peerless field engineers and distributors. He is a mechanical engineering graduate from the University of Southern California and has been with Peerless Pump Division the last five years in sales work, in the Pacific district. His headquarters are at the company's Los Angeles plant, 301 West Ave. 26, Los Angeles 31, Calif.

Mr. Brisbois

Joins Great Lakes Carbon Corp.

Paul T. W. Strub has recently joined Great Lakes Carbon Corp. as manager of commercial development in the engineering and development department. He is located in the Chicago offices. In this new capacity, Mr. Strub will work on the development of new projects for the continued diversification of Great Lakes' activities.

Mr. Strub is a chemical engineering graduate of Bucknell and Lehigh Universities. He formerly served in the technical service group of the Chemical Products Division of ESSO Standard Oil Co., at Baton Rouge, La. and for the past five years has been with the butadiene and styrene section of the Synthetic Rubber Division of Reconstruction Finance Corp.

Heads Atomic Energy Division

J. M. Crothers, electrical engineer of Catalytic Construction Co., Philadelphia, is now in charge of electrical engineering in Catalytic's atomic energy division. He has been in charge of the company's electrical department since 1946. Prior to this, Mr. Crothers was associated with the Sun Oil Co. in the engineering department for approximately 13 years. He is a member of the American Institute of Electrical Engineers and the Society of American Military Engineers.

1952 NACE Award Winners

Starr Thayer, a cathodic protection consultant of Houston, Tex., and Earl A. Gulbransen, advisory engineer to Westinghouse Research Laboratories, East Pittsburgh, Pa., have been designated to receive the 1952 annual Frank Newman Speller and Willis Rodney Whitney awards respectively, from the National Association of Corrosion Engineers. The awards will be presented at the annual banquet of the association scheduled for Thursday, March 13, during the eighth annual conference and exhibition at Galveston, Tex. The Speller award is given for achievement in corrosion engineering. The Whitney award is for achievement in corrosion science.

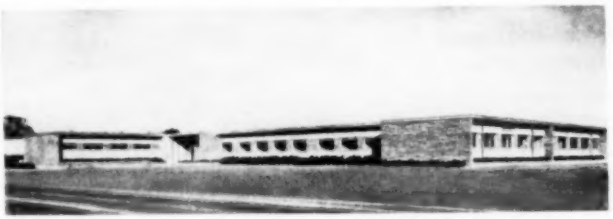
Mr. Thayer, among the first engineers to apply cathodic protection to underground structures, is a 1908 graduate in electrical engineering from Iowa State College.

Dr. Gulbransen, whose principal scientific interests are in the high temperature field, joined Westinghouse Research Laboratories in 1940. He graduated in 1931 from State College of Washington in chemical engineering, and later obtained his Ph. D. in physical chemistry from the University of Pittsburgh.

B & W Tube Company Dissolved

The Babcock & Wilcox Tube Co., a wholly owned subsidiary of The Babcock & Wilcox Co., was dissolved at the close of business December 31st. The company's business and assets were absorbed by the latter and is to be operated as the Tubular Products Division.

Luke E. Sawyer and Edward A. Livingstone, Tube Company officers, have also become officers of The Babcock & Wilcox Co.



Lummus Has New Houston Office Building

Formal occupancy of a new office building took place on February 1st when The Lummus Co. moved its Houston branch organization to new facilities at 2707 Wesleyan Rd., Houston. The new branch houses a heavy concentration of design, engineering and construction functions, plus the various service departments to support them. Houston officials have extended an invitation to all friends of the company to tour the new quarters at their earliest opportunity.

American Cy Expands Catalyst Facilities

In its recently constructed microspheroidal catalyst plant near Michigan City, Ind., American Cyanamid Co. is raising plant production of "MS" catalyst to a level sufficient for a daily 800,000 bbls. of refining capacity. Expansion of the plant comes in the face of a record high demand for high octane fuels. Similar facilities are operated by the company at Fort Worth.

Vast Adventures of Glenn McCarthy Portrays Spirit of Oildom's Gusto

Most every one in oil by now undoubtedly has heard of the spectacular Glenn McCarthy of Houston, of his great wealth in oil and his conjuring his fabulous Shamrock Hotel from the deadly flat land around Houston, just as if he had waved a magic wand. Probably most folks think it is another "Coal Oil Johnny" and get-rich-quick yarn.

But McCarthy is not that. For the cold, hard, cruel and tiring facts that show there never was a magic wand, we refer you to a new book by a fellow townsman entitled, quite accurately, "Corduroy Road," since it is typical of the ups and downs of his still young life, as well as descriptive of the roads he had to build to so many of his leases on the low, flat and swampy land of the Gulf Coast country. The author is Wallace Davis, veteran newspaper man of the Southwest and now an advertising agent and admitted friend of McCarthy. But the book has not suffered by any friendship contact as McCarthy never saw it until after it hit the bookshops.

This book takes the glamour of easy money off McCarthy's wealth as such. It leaves the glamour on his big and most expensive town home, on his large ranch, on his present highly modernized oil properties of leases, gasoline, gas and petrochemical plants. And of course it leaves all the glamour on the spacious and luxurious Shamrock Hotel.

But by the time you reach this last display of glamour you find you have been sweating along with McCarthy, peddling papers, shining shoes, posing as a plumber in patching up stray jobs, running a two-by-four laundry, in fact doing anything to get a nickel for a wife and kids in a dinky apartment.

With McCarthy you have even forgotten he had as a father-in-law, one of the wealthiest oil men of Texas, but whose money McCarthy would not take.

You keep racing along with him, picking up leases, borrowing some money and oil field supply house credit, and all too often drilling dry holes. You help him to load worn out, second-hand drilling equipment on trucks of like vintage, help him tie the junk together with wire, and then you are irritated at his dogged persistence in trying to make the stuff work when it should have been left on the scrap pile.

You are awed by the man's tenacity, energy and confidence in his ability to make a little last to the end of the job, you admire his thrift even though you have seen the Shamrock hotel of 20 years hence, but you find yourself wishing to Heaven that he will at last light somewhere for a few moments and give you—the reader a rest.

On the surface, McCarthy seems to have just been lucky in picking his good leases. Yet considering his early days on a lot of drilling wells, after he left his filling station, and the fact he worked with his father, an old-time production man, you wonder if McCarthy, despite the lack of full-blown college education in geology, might not have gathered more dope on what is under the ground than a lot of others who may have opened many books.

Despite the great opulence of the Shamrock Hotel and of McCarthy, this book does a good job of public relations for the oil industry—because it certainly proves that it generally takes hard work, guts and great tenacity to make wealth in oil. You, no matter where in oil you work, will get benefit from reading the book, and when you have finished it, please pass it on to your associates.

—W. C. P.

Author Says Unity Lacking In Catalysis Entities

A New Approach to Surface Chemistry and to Heterogeneous Catalysis, by W. A. Weyl. 6 x 9 in., 118 pages, heavy paper cover. $3.00. Bulletin No. 57, *School of Mineral Industries*, The Pennsylvania State College, State College, Pa.

Fully aware of the fact that some of the statements made in this treatise require refinement, further elaboration, and no doubt, modification and revision; the author departs intentionally from conventional concepts of chemical reactions in his presentation of heterogeneous catalysis. A few simple reactions are used to illustrate that heterogeneous catalysis involves three entities, namely, the atomic structure of nonpolar molecules as the reactants, the atomic structure of defective crystals or crystal surfaces, and, finally, the electronic properties of solids.

The author, W. A. Weyl, of the department of mineral technology at Pennsylvania State College, believes the major obstacle to contend with is the lack of uniformity in the treatment of the entities involved. In order to be able to describe the participation of catalysts in chemical reactions by means of equations, he has derived a formula system which indicates the defects. This is accomplished by adding to the chemical formula five more symbols which designate excess or deficiency of electrons, vacant cation and anion sites, and finally, atoms which are located in the interstitial lattice positions.

In working out a suitable working correlation of material, Dr. Weyl would welcome all comments and constructive criticisms on the topics presented.

Up-to-date Methods for Treating Boiler Feed Water

Boiler Feed Water Treatment, 3rd Ed., by F. J. Matthews; 5⅝ x 8⅛ in., x + 197 pages, illustrated, indexed, stiff cloth binding, $4.50. Chemical Publishing Co., Inc., 212 Fifth Ave., New York, N. Y.

As the first two editions of *Boiler Feed Water Treatment* were directed to the operator of the small ordinary plant, for treating boiler feed water in the efficient generation of steam, the purpose of this book is to provide him with some guidance in the wide variety of treatment now available.

In this third edition, the text has been completely revised to cover the many developments of boiler feed operations, such as subjects on silicate scale, hydrogen and demineralizing zeolites, colloidal conditioning, use of metaphosphate, the Budenheim process, electrical scale prevention, the prevention of turbine deposits, economizers, scaling and corrosion. Tabular data are available in the appendix.

The principal operating troubles are dealt with, giving the older corrective measures and then showing how their failings have necessitated the development of modern improvements.

There is a section on analysis which includes testing methods required for the efficient operation of softeners. A selection of references is included for those interested in the full details of investigations and subjects.

Revised Organic Chemistry Text Tells of Latest Finds

A. F. Holleman's Organic Chemistry, revised by J. P. Wibaut; 6⅝ x 9¾ in., xix + 660 pages, stiff cloth binding, illustrated, $8.00. Elsevier Publishing Company, 402 Lovett Boulevard, Houston, Texas.

This book is a continuation of the *Textbook of Organic Chemistry* by A. F. Holleman, the last English edition of which appeared in 1930. The work is treated not only from an organic but also from a physico-chemical standpoint.

Composed of three main sections, aliphatic, aromatic, and heterocyclic compounds, the text delves into problems of organic chemistry with relationships to their historical developments.

Recent developments in the chemistry of acetylene, and the preparation of butadiene are presented. The

electronic configuration of the carbon-carbon double bond is dealt with in the structure of the alkenes. Benzene, toluene and other aromatic hydrocarbon occurrences in nature and in industrial products is described with preparations of alkylbenzenes by various name reactions. Cyclo-octatetraene, from the findings of Reppe, has an unsaturated character comparable to benzene, and is described in its various reactions in which it reacts as a bicyclic structure.

That homologues of pyridine and a number of methyl derivatives of quinoline are isolated products from distillates of California petroleum is also related. Structure of naphthenic acids, identified as cyclopentane derivatives, is covered in a brief discussion of petroleum products from the Caucasus and Galicia, together with other derivatives of cyclanes.

The stereochemistry of nitrogen and sulfur compounds is discussed as well as other stereochemical problems with application to electronic formulae. For the benefit of medical and biochemical readers there is much attention devoted to sugars, proteins, alkaloids, vitamins and hormones, the last two in relation to structure and historical development. Many of the antibiotics of importance are dealt with, including the penicillins as derivatives of thiazole.

A thorough presentation of the material includes an author index, subject index and an appendix giving a short introduction on how to consult the literature on organic chemistry, a feature well worth noting, as this subject is often neglected.

The author, J. F. Wibaut, is professor of organic chemistry at the University of Amsterdam, and the book was translated from the sixteenth Dutch edition by Samuel Coffey, section head, research department, I. C. I. Dyestuffs Division, Manchester, England.

Analysis Book Features Butadiene Developments

Light Hydrocarbon Analysis, by the Reconstruction Finance Corp. Butadiene Committee on Specifications and Methods of Analysis, edited by O. W. Burke, Jr., C. E. Starr, Jr., F. D. Toemmler. 7 x 10 in., xv + 639 pages, illustrated, indexed, stiff-cover binding. $15.00. Reinhold Publishing Corp., 330 West 42nd St., New York, 18, N. Y.

The synthetic rubber industry has come of age since its infancy in 1941. Its history, with noteworthy findings in the light hydrocarbons field, is presented in this book. Contributors include the entire rubber industry and related manufacturing fields, associated universities and research institutions.

In conformance with a presidential order of 1945, Reconstruction Finance Corp.'s Committee on Budadiene Specifications and Methods of Analyses completes its wartime emergency assignment in the publication of the book. The presentation is concerned with analytical control and specification phases of butadiene processes. Since butadiene is intimately associated with problems concerning a wide range of hydrocarbons, the scope of the committee's activities includes the study of detailed analyses of numerous light hydrocarbons.

Many contributions submitted on analytical procedures since the time of the war program are included. The butadiene processes employed are briefly described as background material for the development of applicable analytical test methods. Considerable attention is devoted on the sampling and handling of light hydrocarbons, and safety precautions from vast experience are strongly stressed.

A compilation of 54 analytical methods, suitable for direct use, are presented in a reasonable numerical grouping, thus facilitating location. Test results of known mixtures of light hydrocarbons are coupled with methods previously outlined in the

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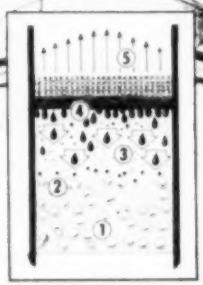

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book. Data obtained are of considerable value to those engaged in designing and operating plants utilizing light hydrocarbons, and of course to those analyzing light hydrocarbon mixtures.

The editors were appointed by the committee to study the available information, abstract it, and present it in a suitable form for maximum distribution and use.

O. W. Burke, Jr., was formerly deputy director in charge of research and development for the Office of Rubber Reserve. C. E. Starr, Jr., is the assistant director of the Esso Standard Oil Co. laboratories, Louisiana Division, and F. D. Tuemmler is the head of the analytical standardization department of the Shell Development Co.

Modern Pyrometry Affords Finer Temperature Control

Modern Pyrometry, by Charles H. Campbell, M. S. 8½ in., vi + 150 pages, illustrated, indexed, stiff cloth binding, $4.00. Chemical Publishing Co., Inc., 212 Fifth Ave., New York, N. Y.

Developed from a lecture designed to illustrate the relatively common and new techniques in pyrometric practice, this book is an aid to newcomers in metallurgy. It serves also as a handy reference for men already in the industry.

Presented simply and effectively are types of equipment and methods of temperature measurement and control, with applications to care and maintenance of pyrometers. An appendix and literature references are included.

The author, Charles H. Campbell, M. S., is research engineer for the American Steel and Wire Co. Research Laboratory, Cleveland, Ohio.

Metco Publishes a Guide to Better Metallizing

The Metco Metallizing Handbook, 5th Edition, by H. S. Ingham and A. P. Shepard. 6 x 9½ in., vi + 249 pages, illustrated, indexed, stiff cloth binding, $3.00. Metallizing Engineering Co., Inc., 38-40 39th St., Long Island City 1, New York.

"When metal wire is sprayed, a new and different metal is created."

This quotation, from the chapter on spraying may well summarize the history of metallizing. The authors provide a comprehensive coverage of the technical as well as the practical aspects of the process, based upon Metco's 20 years of experience in the design, manufacture and use of metallizing equipment.

The text describes surface preparation, with emphasis on cleaning as an essential step in good metallizing, the various methods of preparation, sealing spraying coatings, and finishings. Safety precautions are greatly stressed in these various methods.

When a question of selecting a metal for a new job arises, there are four aspects to be considered automatically, namely, strength, elongation, shrink and hardness. The handbook has a chapter on the physical properties of different sprayed metals and a chapter which aids in the selection of coatings. Probably the only shortcoming in the presentation is noted here. Almost 100 pages separate these two chapters. Either combining these sections or presenting them as succeeding chapters would have made the material more closeknit.

The text is neatly illustrated and achieves the purposes it sets out to accomplish: 1) to provide information for recommending and specifying metallizing jobs, and 2) to provide information on techniques for actually carrying out the work.

This is the fifth edition of the book, the last being in 1946, and it provides all standard practices and metallizing's many developments since that time.

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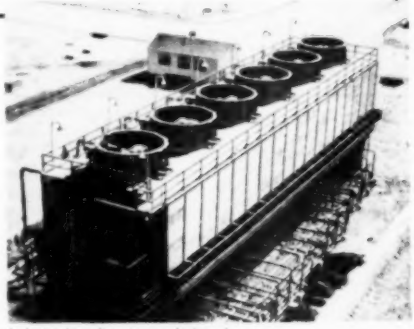
You can always depend on Pritchard Quality Cooling Towers to do the job more efficiently and at greater savings. Pritchard Towers are guaranteed to meet your peak loads as well as normal requirements because they're *adequately* sized and *thoroughly* engineered. Manufactured of highest quality materials for longer life, Pritchard Cooling Towers give you trouble-free service that cuts maintenance and repair costs. You save more water, too — up to 99% over former wasteful methods. Let Pritchard skill and experience go to work for you on your next cooling tower job!



Industrial cooling tower designed, engineered and constructed by J. F. Pritchard & Co.

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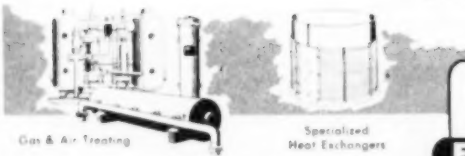

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1952 National Instrument Conference Set for Cleveland

Planning details for the 7th National Instrument Conference and Exposition in Cleveland, Sept. 8-12; this group of committee members were hard at it already in a meeting in Cleveland in February.

Left to right (in order around the table): Robert Tozier, N.A.C.A. Laboratories, technical committee chairman; Gordon Carnegie, King Instrument Co., meeting properties chairman; Fred Lennon, president of Crawford Fitting Co., general conference chairman; Bob Newton, Robert F. Newton Co., vice-chairman; Bill Uhl, PETROLEUM PROCESSING, publicity chairman; Isadore Warshawsky, committee member; Scotty Macdougall, ASME headquarters staff; Frank Brombacher, Bureau of Standards, national meetings committee; Percy Jones, Instrument Society of America, business manager; Millard Shriver, Panellit, Inc., national meetings committee; Richard Rimbach, ISA exhibits manager; Bob Proctor, Pure Oil Co., national meetings committee; and Sam Lee, General Electric Co., national meetings committee.

ACS Petroleum Division Will Meet in Milwaukee

FIFTEEN papers in a three-session symposium on non-hydrocarbon constituents of petroleum will feature the meetings of the American Chemical Society's Division of Petroleum Chemistry during the 121st National ACS Meeting in Milwaukee, March 30-April 3.

In addition, three other general sessions will include discussions of such subjects as Houdriforming, Platforming, hydrogenation of carbon monoxide, and catalysis.

The 1952 Precision Scientific Co. Award in Petroleum Chemistry will be presented to Vladimir Haensel of Universal Oil Products Co. during the general session on Wednesday morning, April 2. Mr. Haensel's address will be on the chemistry of Platforming.

The symposium on non-hydrocarbon constituents on March 31-April 1 include the following papers:

Determination of Trace Metals in Crudes and other Petroleum Oils (Iron, Nickel, Vanadium, and Copper).
Determination of Trace Metals in Petroleum Fractions.
Mechanism of Occurrence of Metals in Petroleum Distillates.
Metalliferous Substances Adsorbed at Crude Petroleum-Water Interfaces.
Petroleum Ash Components and Their Effect on Refractories.
Cyclic Sulfides in a Petroleum Distillate.
Identification of Cyclohexanethiol in Virgin Naphthas.
Elemental Sulfur in Crude Oil.
Thiophenes in Shale-Oil Naphtha.
Application of Ter Meulen Method for Determination of Nitrogen to Petroleum Fractions.
The Distribution of Nitrogen in Petroleum According to Basicity.
Nitrogen Compounds in Domestic Heating Oil Distillates.
Cresylic Acids in Petroleum Naphthas — Assay, Recovery, and Characterization.
Composition of Shale Oil.
Oxygen and Nitrogen Compounds in Shale-Oil Naphtha.

Among topics of interest during the general sessions on April 1-2, are:

Extraction of Lubricating Oil with Furfural.
Correlation of Vapor-Liquid Equilibria for Binary Hydrocarbon-Water Systems.
Vapor-Liquid Equilibria for Propane-Water System.
Recycled Isomerization of Olefins.
A Single Test for the Knock and Ignition Tendency of Fuels Based on Ignition Delay Measurements.
Hondriforming Reactions: Studies with Pure Hydrocarbons, and Catalytic Mechanism.
Estimation of Pyrrole Nitrogen in Petroleum Distillates.
Products of the Hydrogenation of Carbon Monoxide over an Iron Catalyst: aliphatic and alicyclic aromatics; water-soluble oxygenated; and oil-soluble oxygenated compounds; and relation of product composition to reaction mechanism.
Determination of Individual Alkyl Aromatic Hydrocarbons from Benzene through the C_{10}'s by Infrared Spectrometery.
Structure of Cobalt Catalysts Supported on Diatomaceous Earth.
Thermal Pyrolysis of Propane and the Butanes at Elevated Pressures.
Thermal Decomposition of Thiols.
Effect of Granule Size in Catalytic Reactions.
Reactions of Hydrocarbons over Cracking Catalysts.

Oil Man's Calendar

MARCH

American Society of Mechanical Engineers, spring meeting, University of Washington, Seattle, Wash. March 24-26.
Warren Petroleum Refiners Association, 40th annual meeting, The Plaza Hotel, San Antonio, Tex. March 31-April 2.
American Chemical Society, 121st national meeting, Hotels Statler, Buffalo, and Lafayette, Buffalo, N. Y. March 24-27. (Also to be held in Milwaukee, Hotel Schroeder, Mar. 31-April 3.)

APRIL

National Packaging Exposition, Auditorium, Atlantic City, N. J. April 1-4.
American Society of Lubrication Engineers, "A Short Course in Fundamentals of Lubricating Materials," Case Institute of Technology, Cleveland, O. April 2-5.
American Society of Lubrication Engineers, annual meeting, Hotel Statler, Cleveland, O. April 7-9.
National Petroleum Association, semi-annual meeting, Hotel Cleveland, Cleveland, O. April 16-18.
American Institute of Chemical Engineers, symposium on corrosion, Akron, O. April 21.
Independent Petroleum Assn. of America, mid-year meeting, Deshler-Wallick Hotel, Columbus, O. April 28-29.
Natural Gasoline Association of America, 31st annual convention, Rice Hotel, Houston, Texas. April 30-May 2.

MAY

Association for Computing Machinery, spring meeting, Mellon Institute, Pittsburgh, Pa. May 2-3.
American Chemical Society, Division of Gas and Fuel Chemistry, School of Mineral Industries, Pennsylvania State College, State College, Pa. May 5-6.
National Air Pollution Symposium, second annual meeting, Hotel Huntington, Pasadena, Calif. May 5-6.

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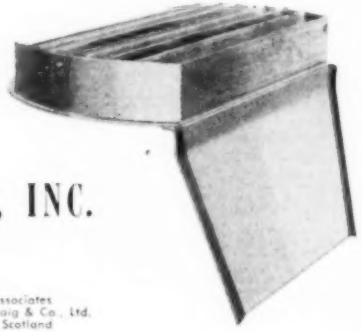

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REFINING TRENDS

Current Data on Crude Runs, Product Supply and Demand

East Coast Refineries Hard Pressed, But Meet Heating Oil Demand in Area

THE combination of flexible plant operations and a mild winter throughout the east has enabled refiners in the East Coast district to meet the demands on their plants for heating oils, including distillate fuels principally and kerosine. The fact they will be called on to supply an even larger demand next winter and the possibility of a colder winter than the one just ending is already being recognized by operators as calling for advance preparations over the months when storage will be replenished.

On Feb. 23 (API data) East Coast refinery stocks of 16,361,000 bbls. of distillates and 6,738,000 bbls. of kerosine (total of 23,099,000 bbls.) represented a reduction of 24,422,000 bbls. from the peak of storage early last November. Stocks on Feb. 23, were about 3,750,000 bbls. above the volume on hand Feb. 24, 1951. For the 16 weeks of the current withdrawal period the average withdrawal rate was around 1,525,000 bbls. a week. However, the first three weeks of February withdrawals had slackened to around 960,000 bbls. a week. Had weather conditions been such that reductions in stocks continued at the average rate for the season, or higher, the total heating oil stocks in East Coast refineries would have been close to the figure for the same date in 1951.

The actual reduction in East Coast heating oil stocks in the 16-week period from Nov. 3-Feb. 23 was 4,820,000 bbls. greater (24%) than in the corresponding 16 weeks in 1950-51. For the country east of California, the reduction in distillate and kerosine stocks combined for the 16-week period this year was 60,386,000 bbls. as compared with withdrawals of 51,754,000 bbls. in the same period in 1950-51. The 8,632,000 bbls. more withdrawn this season were 17% greater than the total withdrawn in the 1950-51 period.

For the Texas and Louisiana Gulf Coast areas, heating oil stocks were reduced from 26,737,000 bbls. on Nov. 3, '51 to 14,740,000 bbls. on Feb. 23, the amount of reduction being just under 12,000,000 bbls. During the same 16-week period in 1950-51, reductions in heating oil stocks in these districts were about 12,700,000 bbls., a little larger than this current season. The drop off this year is likely due to a price ceiling which, combined with current tanker rates, made it uneconomic to move material from these refineries into the northeast territory of concentrated heating oil consumption.

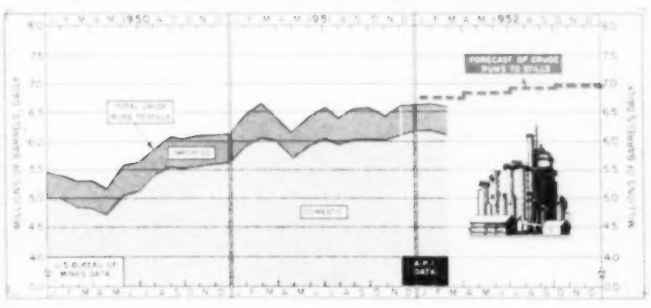
One means by which East Coast refiners have kept up with demand for heating oil is by running to a higher yield of distillate products than do other districts. In November, '51, by the Bureau of Mines reports, yield on distillate products was 26%, as compared with 20.4% for the entire U. S. In November, 1950, distillate yields were 25.6% as against 20% for the country.

Achieving a high throughput of distillate products cost the East Coast refiners something in gasoline output. The November yield of gasoline was 35.7% as against 40.4% for the country at large and the gasoline yield here the past years had been about 5 points under that for the country.

The current effect of this is shown in present East Coast gasoline stocks. From Nov. 10, 1951, to Feb. 23, East Coast stocks here increased only a little over 1,000,000 bbls. to a total of 24,681,000 bbls. The amount of the increase was only 4-5% of the total last November. Total stocks in this area Feb. 23, 24,681,000 bbls., are actually about 1,000,000 bbls. less than were on hand Feb. 24, 1951. The same small buildup of gasoline stocks occurred in this area in the period from Nov. 11, '50-Feb. 24, '51. East of California the gasoline stock buildup to Feb. 23 has been 33% of the total on hand last November.

The principal means of protection for East Coast oil companies against next season's higher heating oil demand appears to be some readjustment in the price and transportation cost differential which will let more material from the Gulf Coast move into this part of the country. Whatever additions to refining capacity in this territory are made before 1953 will help also. Additions to storage capacity will enable stocks, both primary and secondary, to be built up to some extent. Some means for providing regularly statistics as to the volume of heating oils in the secondary, or local distributors' storage, would also enable all the companies to do more accurate planning as to what heating oils stock replenishments must be this summer.

Fig. 1—Crude Runs Little Easier in Early Feb.



Crude Runs to Stills

Daily Average (1000 bbls.)

	Domestic	Foreign	TOTAL
Feb. '52 API*	6,054	454	6,508
Feb. '51 BM	6,071	489	6,560
Change	−17	−35	−24
% Change	.00	7.1	.00

* Through Feb. 23

Total (1000 bbls.)
(Bureau of Mines Data)

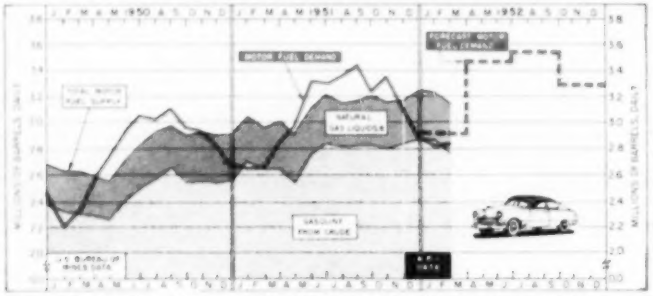
12 Mos. '51	2,188,106	181,779	2,369,975
12 Mos. '50	1,918,854	176,013	2,094,867
Change	+269,342	+5,766	+275,108
% Change	14.0	3.3	13.1

BM Forecast of Crude Runs to Stills, 1952
(Nov. 28, 1951, and avg. for quarters)
1st Q., 6,680; 2nd Q., 6,720; 3rd Q., 6,800; 4th Q., 6,830

Yields on Crude Runs to Stills

	Gasoline %	Kerosine %	Dist. Fuels %	Resid. Fuels %
Feb. '52 API	42.8	5.6	22.5	19.7
Jan. '52 API	42.8	6.2	21.6	19.9
Dec. '51 BM	45.5	5.7	22.1	19.5
Feb. '51 BM	40.4	6.3	21.7	21.1

Fig. 2—Motor Fuel Demand Turns Upward



* Natural Gas Liquids include gasoline blended at refineries, and that used as finished motor fuel.

Fig. 3—"Gas" Stocks in February Pass 1951 Peak

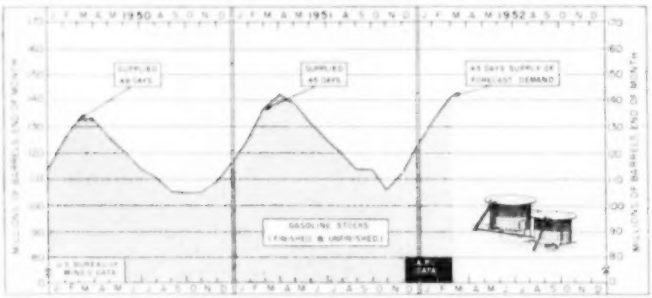

SUPPLIED 45 DAYS
SUPPLIED 45 DAYS
45 DAYS SUPPLY OF FORECAST DEMAND
GASOLINE STOCKS (FINISHED & UNFINISHED)
A.P.I. DATA
U.S. BUREAU OF MINES DATA

Fig. 4—Heating Oil Demand Drops in February

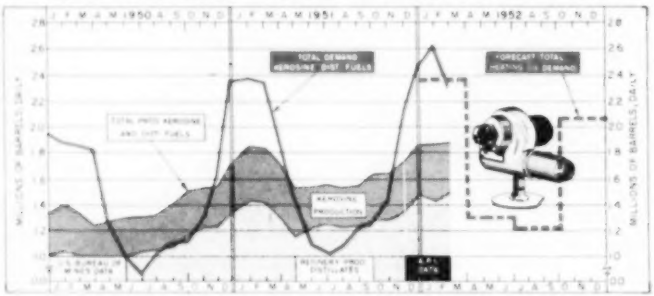
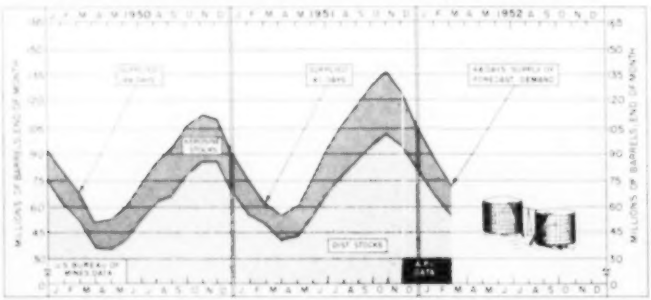

TOTAL DEMAND KEROSINE DIST FUELS
FORECAST TOTAL HEATING OIL DEMAND
TOTAL PROD KEROSINE AND DIST FUELS
KEROSINE PRODUCTION
REFINERY PROD DISTILLATES
A.P.I. DATA
U.S. BUREAU OF MINES DATA

Fig. 5—Smaller Draft on Heating Oil Stocks



Motor Fuel Supply

Daily Average (1000 bbls.)

	Gasoline from Crude	Natural Blended Used Direct	TOTAL
Feb. '52 API*	2,783	260	3,140
Feb. '51 BM	2,655	356	3,991
Change	+128	+24	+149
% Change	4.7	7.1	4.9

* Through Feb. 23

Total (1000 bbls.)
(Bureau of Mines Data)

12 Mos. '51	1,050,265	130,112	1,180,377
12 Mos. '50	901,454	120,994	1,024,448
Change	+148,811	+9,118	+155,929
% Change	11.8	7.5	11.3

Motor Fuel Demand

Including Exports

Daily Average (1000 bbls.)

Feb. '52 API*	2,860
Feb. '51 BM	2,654
Change	+206
% Change	7.7

* Through Feb. 23

Total (1000 bbls.)
(Bureau of Mines Data)

12 Mos. '51	1,132,508
12 Mos. '50	1,018,997
Change	+113,511
% Change	11.1

BM Forecast of Motor Fuel Demand, 1952
(Nov. 28, 1951, bbl. avg. by quarters)
1st Q., 2,925; 2nd Q., 3,480; 3d Q., 3,562; 4th Q., 3,304

Gasoline Stocks

Finished and unfinished, end of month (1000 bbls.)

Feb. '52 API*	141,761
Jan. '52 API	145,510
Dec. '51 BM	131,315
Feb. '51 BM	131,243

* On Feb. 23

Heating Oils Production

(Kerosine and Distillates)

Daily Average (1000 bbls.)

	Kerosine	Dist. Fuels	TOTAL
Feb. '52 API*	466	1,496	1,962
Feb. '51 BM	410	1,419	1,829
Change	+44	+77	+133
% Change	10.7	5.4	7.8

* Through Feb. 23

Total (1000 bbls.)
(Bureau of Mines Data)

12 Mos. '51	177,171	434,625	611,796
12 Mos. '50	158,512	408,912	567,424
Change	+18,661	+25,713	+44,374
% Change	11.1	18.5	18.2

Heating Oils Demand

Daily Average (1000 bbls.)

	Kerosine	Dist. Fuels	TOTAL
Feb. '52 API*	430	1,903	2,333
Feb. '51 BM	505	1,819	2,324
Change	−83	+46	−19
% Change	12.1	2.5	00

* Through Feb. 23

Total (1000 bbls.)
(Bureau of Mines Data)

12 Mos. '51	130,096	412,107	602,503
12 Mos. '50	119,922	407,276	527,198
Change	+10,474	+4,831	+75,305
% Change	8.7	1.1	14.3

BM Forecast of Heating Oils Demand, 1952
(Nov. 28, 1951, bbl. avg. by quarters)
1st Q., 2,595; 2nd Q., 1,399; 3d Q., 1,329; 4th Q., 2,087

Heating Oil Stocks

(1000 bbls. end of month)

	Kerosine	Dist. Fuels	TOTAL
Feb. '52 API*	17,302	55,655	72,957
Jan. '52 API	20,419	63,550	83,969
Dec. '51 BM	25,140	82,532	107,672
Feb. '51 BM	13,150	47,587	60,737

* On Feb. 23

Fig. 6—Residual Demand Declines in February

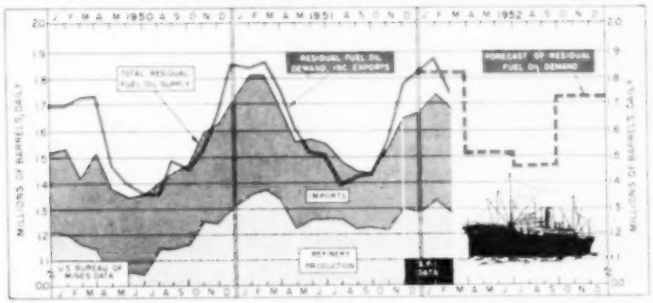
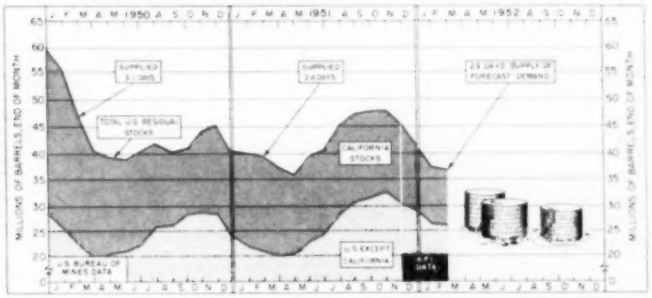

J F M A M 1950 A S O N D
J F M A M 1951 A S O N D
J F M A M 1952 A S O N D
MILLIONS OF BARRELS DAILY
TOTAL RESIDUAL FUEL OIL SUPPLY
RESIDUAL FUEL OIL DEMAND, INC. EXPORTS
FORECAST OF RESIDUAL FUEL OIL DEMAND
IMPORTS
REFINERY PRODUCTION
U.S. BUREAU OF MINES DATA
B.M. DATA

Fig. 7—U.S. Residual Stocks Under 1951 Level


J F M A M 1950 A S O N D
J F M A M 1951 A S O N D
J F M A M 1952 A S O N D
MILLIONS OF BARRELS END OF MONTH
SUPPLIED 31.3 DAYS
SUPPLIED 24 DAYS
25 DAYS SUPPLY OF FORECAST DEMAND
TOTAL U.S. RESIDUAL STOCKS
CALIFORNIA STOCKS
U.S. EXCEPT CALIFORNIA
U.S. BUREAU OF MINES DATA
B.M. DATA

Residual Fuels Production

Daily Average (1000 bbls.)

	Refinery Output	Imports	TOTAL
Feb. '52 API*	1,270	410	1,680
Feb. '51 BM	1,382	432	1,814
Change	—92	—22	—134
% Change	6.6	7.4	6.8

* Through Feb. 23

Total (1000 bbls.)
(Bureau of Mines Data)

12 Mos. '51	468,881	118,470	587,351
12 Mos. '50	425,217	119,186	544,403
Change	+43,664	—716	+42,948
% Change	10.3	0.6	7.9

Residual Fuels Demand

Daily Average (1000 bbls.)

Feb. '52 API*	1,740
Feb. '51 BM	1,862
Change	—122
% Change	6.5

* Through Feb. 23

Total Demand (1000 bbls.)

12 Mos. '51	502,301
12 Mos. '50	360,171
Change	+23,130
% Change	4.1

BM Forecast Residual Fuels Demand, 1952
(Nov. 28, 1951, fcst. avg. by quarters)
1st Q., 1,810; 2nd Q., 1,595; 3d Q., 1,456; 4th Q., 1,728

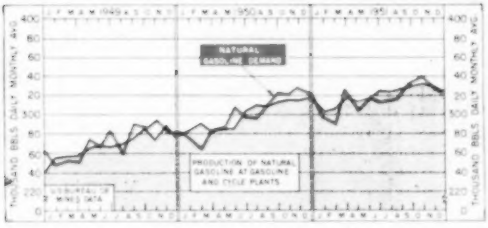
Residual Fuel Stocks

1000 bbls. end of month

	U. S. Except California	Total U.S.
Feb. '52 API*	26,211	37,111
Jan. '52 API	27,215	38,200
Dec. '51 BM	29,269	42,448
Feb. '51 BM	21,430	29,409

* On Feb. 23

Fig. 8—Production and Demand of Natural Gas Liquids


THOUSAND BBLS DAILY MONTHLY AVG.
NATURAL GASOLINE DEMAND
PRODUCTION OF NATURAL GASOLINE AT GASOLINE AND CYCLE PLANTS
U.S. BUREAU OF MINES DATA

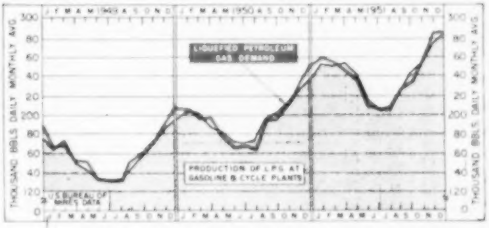
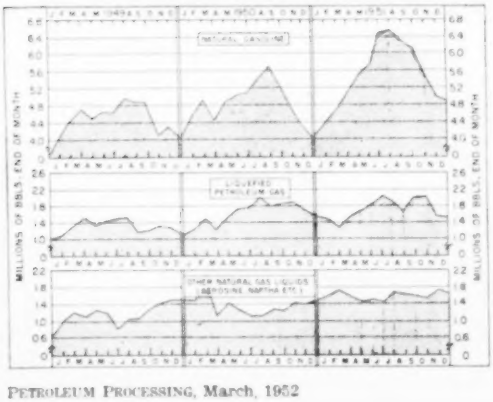

THOUSAND BBLS DAILY MONTHLY AVG.
LIQUEFIED PETROLEUM GAS DEMAND
PRODUCTION OF L.P.G. AT GASOLINE & CYCLE PLANTS
U.S. BUREAU OF MINES DATA

Fig. 9—Stocks of Natural Gas Liquids



Natural Gas Liquids Statistics

(Source: U. S. Bureau of Mines Report on Natural Gasoline and Cycle Plant Operations)

	Production (1000 bbl./day avg.) Natural Gasoline	LPG**	TOTAL	Demand* (1000 bbl./day avg.) Natural Gasoline	LPG	TOTAL
Dec. '51	335	285	620	320	285	605
Dec. '50	318	258	576	329	242	562
Change	+7	+42	+54	—90	+43	+43
% Change	2.2	16.7	9.6	—	17.8	7.6

	Total Production (1000 bbl.)			Total Demand (1000 bbl.)		
12 Mos. '51	117,045	88,467	205,512	115,393	87,926	203,319
12 Mos. '50	109,879	72,282	181,961	109,199	71,352	180,551
Change	+7,166	+16,185	+23,351	+6,194	+16,564	+22,748
% Change	6.7	22.4	12.9	5.7	23.2	12.6

Stocks, End of Month (1000 bbl.)

	By Type of Product— Natural Gasoline	LPG	Other Products†	By Location— Refineries	Gasoline Plants	TOTAL
Dec. '51	4,309	1,495	1,730	2,687	5,460	8,148
Nov. '51	5,033	1,506	1,748	2,801	5,576	8,379
Dec. '50	4,187	1,661	1,507	2,268	5,087	7,355

* Demand, including exports but not transfers, is supplied from receipts from outside sources as well as current production and stock changes at gasoline plants. Outside receipts in December totaled 140,000 bbls.

** Does not include LPG produced at refineries which in December totaled 3,120,000 bbls.

† Includes naphtha, kerosine, specialty and other products.

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(A6) AMERICAN DISTRICT STEAM CO., THE 296
(A7) ANACONDA COPPER MINING CO. 350
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(B1) BLACK, SIVALLS & BRYSON, INC. 368
(B2) BROWN FINTUBE CO., THE 293
(B3) BYRON JACKSON CO. 307
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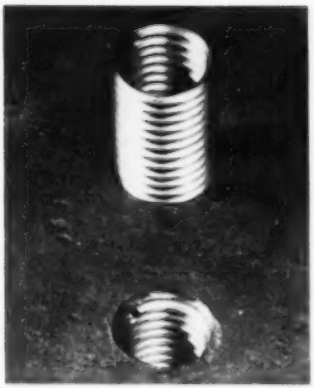
(B5) CHICAGO BRIDGE & IRON CO. 285
(B6) CHIKSAN CO. 359
(B7) CLARK BROS. INC. 320
(B8) CLARK MFG. CO., THE 367
(B9) COOPER-BESSEMER CORP., THE 297
(C1) CRANE CO. 313
(C2) CRAWFORD FITTING CO., THE 396
(C3) DOWELL, INC. 372
(C4) DU PONT DE NEMOURS & CO., INC., E. I. ..... Facing 296, 297
(C5) DU PONT DE NEMOURS & CO., INC., E. I. 362
(C6) DURAMETALLIC CORP. 395
(C7) ELECTRIC AUTO-LITE CO., THE 395
(C8) ENJAY CO., INC. 394
(C9) ETHYL CORP. ..... Facing Inside Front Cover
(D1) FARRIS ENGINEERING CORP. 281
(D2) FILTROL CORP. 294
(D3) FISCHER & PORTER CO. 287
(D4) FISHER GOVERNOR CO. 284
(D5) FLUOR CORP., LTD., THE 286
(D6) FOSTER WHEELER CORP. 354
(A2) GENERAL CHEMICAL DIV., ALLIED CHEMICAL & DYE CORP. ..... Inside Back Cover
(D7) GLOBE STEEL TUBES CO. 312
(D8) GRAVER TANK & MFG. CO., INC. 274
(D9) GRAVER WATER CONDITIONING CO. 317
(E1) HARTZELL PROPELLER FAN CO. 268
(E2) HAYS CORP. 314
(E3) HOOKER ELECTROCHEMICAL CO. 311
(E4) HUDSON ENGINEERING CORP. ..... Inside Front Cover
(E5) INSTRUMENTS, INC. 398
(E6) INSUL-MASTIC CORP. OF AMERICA 273
(E7) KELLOGG CO., THE M. W. 268, 269
(E8) KIELEY & MUELLER 304
(E9) KOCH ENGINEERING CO. 380
(F1) LUMMUS CO., THE 295
(F2) McKEE & CO., ARTHUR G. 292
(F3) METAL TEXTILE CORP. 376
(F4) MINNEAPOLIS-HONEYWELL REGULATOR CO. 290, 291
(F5) MONSANTO CHEMICAL CO. 277
(F6) NATIONAL AIROIL BURNER CO. 291
(F7) NATIONAL ALUMINATE CORP. 310
(F8) NICHOLSON & CO., W. H. 391
(F9) NORDSTROM VALVE DIV., ROCKWELL MFG. CO. 282, 283
(G1) NORTON CO. 301
(G2) OAKITE PRODUCTS, INC. 392
(G3) OIL WELL SUPPLY CO., UNITED STATES STEEL CORP. 364
(G4) ORBIT VALVE CO. 370
(G5) PACIFIC PUMPS, INC. 390
(G6) PETRO-CHEM DEVELOPMENT CO., INC. 279
(G7) PITTSBURGH LECTRODRYER CORP. 315
(G8) POWELL CO., THE WM. 265
(G9) PRITCHARD & CO., J. F. 363
(H1) PRITCHARD & CO., J. F. 378
(H2) PRITCHARD & CO., J. F. 389
(H3) PROCON, INC. 270
(H4) RIDGE TOOL CO., THE 278
(H5) ROOTS-CONNERSVILLE BLOWER CORP. 352
(H6) SHERWIN-WILLIAMS CO., THE 357
(H7) SIMS PUMP VALVE CO., INC. 393
(H8) SINCLAIR RESEARCH LABORATORIES, INC. 318, 319
(H9) SWARTWOUT CO., THE 300
(I1) TAYLOR FORGE & PIPE WORKS 399
(I3) TENNESSEE EASTMAN CO. 298
(I4) THERMO ELECTRIC CO., INC. 356
(I5) TRANE CO., THE 299
(I6) UNIVERSAL OIL PRODUCTS CO. 302, 303
(I7) U. S. STONEWARE CO. 377
(I8) VOGT MACHINE CO., HENRY ... 353
(I9) WARNER LEWIS CO. 388
(J1) WATSON-STILLMAN CO. 289
(J2) WESTINGHOUSE ELECTRIC CORP. 361
(J3) WOLVERINE TUBE DIV. 280
(J4) WYATT METAL & BOILER WORKS ..... Outside Back Cover
(J5) YARNALL-WARING CO. 393
(J6) YOUNG RADIATOR CO. 309

WHAT'S NEW!

Equipment
Materials
Processes
Literature

Reviewed by WILLIAM C. UHL, Equipment Editor



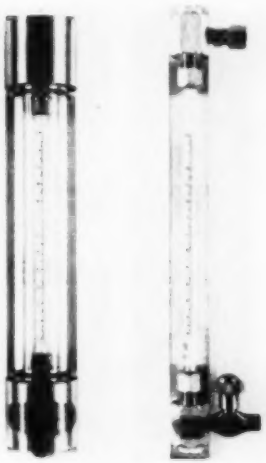
Casting Threads Restored Fast With Wire Thread Inserts

Stainless-steel, helical-wire, thread inserts are reducing equipment "down-time" wherever machine operations are impaired by stripped or worn threaded holes. Tapped threads in all types of industrial castings—fuel pumps, cylinder blocks, motor cases, pump housings, subjected to extreme vibration may be quickly and economically restored with these inserts. Time and cost savings up to 80 percent have been reported when comparing the wire-insert method of thread repair with conventional ones, manufacturer states. In addition they provide higher loading strengths and are more resistant to wear and corrosion than original threads. The wire-insert operation requires only the cleaning out of the damaged thread, the re-tapping of the hole with "Heli-Coil" taps and the placement of the wire insert in the re-threaded hole. Because they are slightly larger than the hole into which they are installed, these thread inserts are self-locking. Vibration or bolt tightening will not loosen them. They can be removed easily if necessary with a special tool. Heli-Coil inserts are available in 4-40 to $1\frac{1}{2}$-6 sizes in the National and Unified Coarse thread series; 6-40 to $1\frac{1}{2}$-12 in the National and Unified Fine thread series; supplied in 1, $1\frac{1}{2}$ and 2-diameter lengths. For special applications, non-standard threads and sizes can be supplied. Heli-Coil Corp., 1184 Shelter Rock Lane, Danbury, Conn.

Circle No. 1 on Reply Card

For More Information

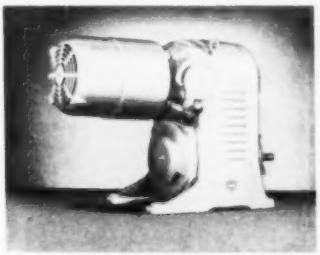
Use one of the attached reply cards to request additional details or literature on any items reviewed in "What's New!" Just circle the numbers corresponding to the numbers at the end of each item in which you are interested. Then fill in the rest of the card and drop it in the mail. No postage required.



Micro Flow Meter Can Measure Rates from 6 to 105 ml. min.

A new flowmeter of the variable-area type has been developed for micro metering in the laboratory or pilot plant. Both the high pressure (1000 psig.) and low pressure (100 psig.) models have maximum flow rates of 6-105 ml. min. for water, and 90-610 ml. min. for air at 20° C. Four sizes of tubes and float compositions are stocked. Tubes can be replaced in two minutes. Threading is for $\frac{1}{8}$-in. pipe. The meters use a rotating float in a tapered glass tube, which has a fused-on, solvent-proof scale in millimeters. Neoprene gaskets are used on the low-pressure model; a choice of neoprene or teflon makes the high pressure model suitable for highly corrosive fluids. Both models can be had in brass, and Types 303 or 316 stainless steel. Floats made of plastic, aluminum, stainless steel, and gold are stocked; nickel and platinum floats can be supplied. A special ionizing anti-static device, which eliminates completely the erratic operation characteristic of plastic floats on gas flows, can be factory installed for such services. Technical Equipment Co., 4348 San Pablo Ave., Emeryville 8, Calif.

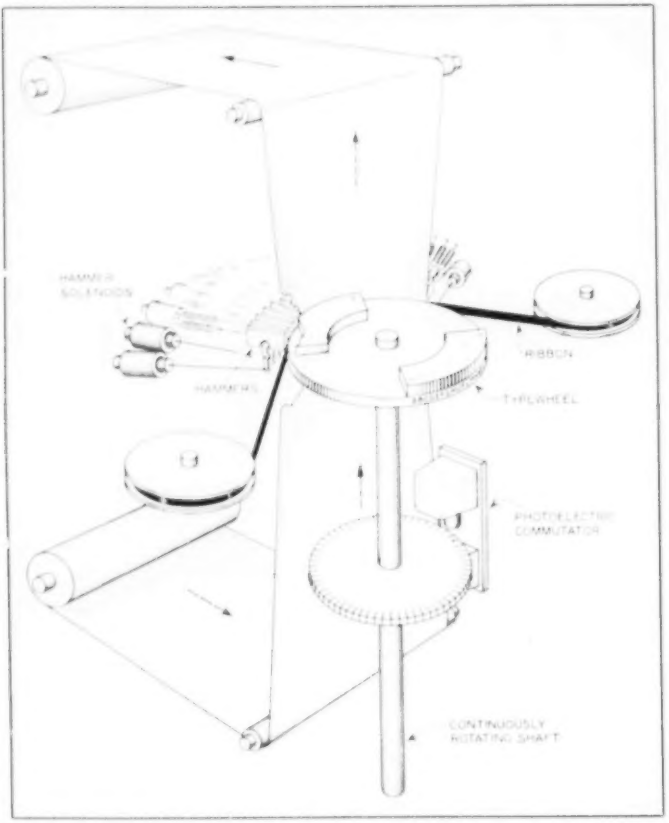
Circle No. 2 on Reply Card



Explosion Dangers Eliminated In Design of Electric Motor

With the broadened application of variable speed to many industries comes the development of a motor which can be operated safely in dangerous locations. To provide such power, a combined explosion-proof vari-drive motor has been designed, in contrast to the conventional method of connecting an explosion-proof motor with a separate speed changer. The motor is self-contained, all mounted in one frame, occupying a single base, thus eliminating intermediate connections and saving space. The motor element is totally-enclosed and air movement is blasted over the enclosed unit from the exterior by a spark-proof fan housed within the end sector. This motor unit is mounted on the vari-drive assembly. A control dial provides instant speed change. The motor is available in output speeds from 2 to 10,000 rpm. in ratings from 1 to 20 hp. When gear reductions are necessary they are incorporated as an integral unit of the drive. U. S. Electrical Motors, Inc., 200 E. Slauson Ave., Los Angeles 54, Calif.

Circle No. 3 on Reply Card



24,000 CHARACTERS PER MINUTE printing rate made possible in electronically operated typewriter

Ultra High Speed Data Printer

With a printing rate of 24,000 characters per minute, a new "Flying Typewriter" is expected to find wide application in the fields of computing, data handling, and communications. A total of 47 characters comprising the alphabet, numerals and special other symbols is employed. A line at a time is printed using ordinary paper, standard typewriter ribbon.

The major feature of the instrument is an electronic serial-parallel storage unit. This accepts information in coded pulse form from an external source such as a computer, magnetic tape, punched cards, etc. Eighty channels corresponding to the characters per line may be serial or parallel fed according to input requirements. Information is alternately stored and extracted in these channels, completing the cycle once for each line printed.

The type is arranged in segments around the periphery of an 8-in. disc rotating in a horizontal plane at 300 rpm. Eighty hammers arranged in an arc parallel to the type wheel are electro-mechanically impulsed at appropriate times against the type faces according to instructions from the electronic storage. Impressions are registered on the paper being fed intermittently upward from a roll and conforming to the curve of the type wheel. A photoelectric pulse generator on the shaft of the wheel processes the characters out of the electronic storage. The system is self-synchronous and can be operated continuously or intermittently.

The electronic storage, which is essentially an extremely flexible shift register, may be used as part of a computer to perform conventional arithmetic functions. Potter Instrument Co., Inc., Great Neck, N. Y.

Circle No. 4 on Reply Card

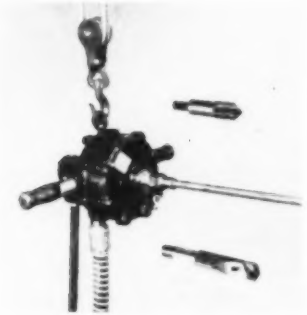
Metal Cleaning Process Redeems Irreplaceable Equipment Items

Developed for desanding castings and other metal cleaning applications, "Virgo Molten Cleaner" has been found extremely effective in reclaiming valves, pipe fittings, and chemical equipment such as pumps, cooling coils and miscellaneous alloy parts. Over $20,000 worth of materials, including some irreplaceable pieces of equipment, were salvaged in one year by Hooker Electrochemical Co., Niagara Falls, N. Y., at an approximate cost of only $3000. The following table shows the replacement value of the materials which were treated and subsequently reused. The process was operated for 23 eight-hour working days.

Items Salvaged	New Value
5,000 Cast Iron and Steel Flanges	$4,200
1,250 Miscellaneous pipe fittings	2,800
2,000 Machine Bolts	250
500 lbs. Hex Nuts	100
2,900 lbs. Scrap Nickel	1,450
700 lbs. Scrap Hastelloy C	500
600 ft. Nickel Pipe	3,000
	$12,300

In addition, 190 assorted nickel and alloy valves which had previously been rejected for repair by the manufacturer, were processed and then were acceptable for reconditioning. To date, 132 of these valves have been "factory reconditioned" at a cost of $1,750. The current replacement value of these valves is $8,588. A small number of brass globe valves has also been successfully processed. The cleaning unit employs a pot 10 x 3½ x 4 ft. deep carrying an initial Virgo Cleaner charge of five tons. It is heated by two oil immersion heaters, and operates at a temperature of about 850° F. Most of the items cleaned for salvage could easily have been treated in a smaller furnace, say 2 ft. in diameter by 3 ft. deep. This would materially reduce the cost of heating and depreciation. The larger salvage unit with auxiliary equipment including heating apparatus, hoist, quench tank, acid tank, etc., costs in the neighborhood of $15,000. Of course the cost varies accordingly, depending upon what equipment already on hand may be converted to use. Since the bath is a fused salt at a temperature of 850° F, certain precautions must be observed in the operation. All materials placed in the bath should first be freed from moisture to prevent spattering. Greases and other organic matter generally burn at the bath temperature and provisions must be made for exhausting the fumes and smoke. Hooker Electrochemical Co., Niagara Falls, N. Y.

Circle No. 5 on Reply Card



Condenser Cleaner Efficiently Removes Hard or Soft Deposits

A new line of suspension-type condenser tube cleaners which incorporate improvements in design and control have been developed. The cleaners are especially designed for cleaning small, straight tubes, and proper selection of cleaning tools guarantees efficient removal of either hard or soft deposits. In operation they are supported from overhead. The cleaner motor has been adapted from a design used on heavy-duty refinery tube cleaners. Two ball type thrust bearings absorb the push and pull forces imposed on the cleaner during operation. The control valve is actuated by a squeeze trigger located at the base of one of the operating handles. Convenient to the operator's right hand, but not in a position to be opened accidentally, the trigger actuates a simple throttle valve which can be regulated continuously from wide open to shut-off. When the trigger is released, the valve opens and the motor stops. The trigger also controls the flow of water for cooling the drills and flushing out the loosened scale. The water-feeding mechanism features a self-adjusting packing which can be changed to handle either water or solvent, as the application demands. An improved heavy-duty electric motor, with trigger-controlled valve and built-in water feeding attachment on the front end of the motor, is also available for use where a supply of compressed air is not on hand. Two drill heads have been designed for use with the new cleaners. For soft, gummy deposits, where strong flushing action is required, a "Drill Tip" and adapter is employed (upper drill in photograph). The drill incorporates passages for four separate water, or solvent, jets, which prevent clogging by the gummy deposit being removed. For extremely hard deposits, a carbide-tipped drill is recommended (lower drill in photograph). Elliott Co., Jeannette, Pa.

Circle No. **6** *on Reply Card*

Currentless pH Meter Has Measuring Accuracy of .01 pH

Designed for all pH and rH work, the Philips Universal pH Meter is precision built for laboratory research and industrial testing purposes. It

provides a measuring accuracy of 0.01 pH or 0.5 mv., a range of 0—14.15 pH and 0—1415 mv. Absolutely currentless measuring with no phenomena of polarization, zero indication by cathode ray tube, it can be used with glass, quinhydrone, hydrogen and platina electrodes and is direct calibrated for the first three. The unit is supplied with a removable calomel and glass electrode and is provided with controls to correct for temperature variations and for asymmetric potentials. It has a built-in cadmium standard cell and a flexible cable with a plug for connection to a 60 cycle A.C. power supply circuit. Transformer taps can be changed to accommodate the following voltages: 110, 125, 145, 200, 220 and 245. Research & Control Instruments Div., North American Philips Co., Inc. 750 So. Fulton Ave., Mt. Vernon, N. Y.

Circle No. **7** *on Reply Card*

DID YOU MISS THESE?

The following items, reviewed originally in the January issue, have aroused considerable interest. They are repeated briefly as a service to those who might have missed them. For details or literature, use the regular Reply Card in this issue.

Electronic Flowmeter Measures Very Low Pressure Differences

Operating from a noble metal thermopile, a sensitive, electronic manometer and flowmeter will measure extremely low pressure differences, having a dual range of 0.001 to 0.1 in. and 0.1 to 2 in. water. It uses no glass or plastic tubes and contains no fluids. Two taps on the gauge tube are connected to the two points at which pressure difference is to be metered. For use as a flowmeter, the tube is placed directly in the line for low rates or connected to pressure taps on two sides of a calibrated orifice for high rates. Calibration and accuracy are not affected by long cables from gauge tube to meter. The unit operates on 110 volt, 60 cycle A.C. Hastings Instrument Co., Inc., Superhighway and Pine Ave., Hampstead 10, Va.

Circle No. **8** *on Reply Card*

Surface Thermometer Attaches To Any Material, Good to 300 F.

A surface temperature thermometer, with a range of 0 to 300° F. in 2° increments, is designed for checking outside temperatures of pipes, electric motors, bearings, cylinder blocks, etc. It is quickly attached to any flat surface with the Silicone grease supplied with the instrument; or it can be obtained with a magnetic clamp for fastening to steel or other ferrous materials. A mirror on the dial compensates for external radiation effects. Pacific Transducer Co., 11921 West Pico Blvd., Los Angeles 64, Calif.

Circle No. **9** *on Reply Card*

An Alloy "Fairy Tale"

Alloys in Cooperland, 26-page booklet done in "Alice-in-Wonderland" style, with Disney-like drawings, doing a first-rate job of describing the alloy manufacturing activities in all its phases from pattern shop to shipping dock of Cooper Alloy Foundry Co., Hillside 5, N. J.

Circle No. **10** *on Reply Card*

Revised Gas Analysis Reference

Fisher Gas-Analysis Manual, 4th revised edition; 60-page manual discussing theory, giving details on procedures in various analyses, and describing maintenance and operation of "Unitized" Gas Analysis Apparatus. Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Penna.

Circle No. **11** *on Reply Card*

Electrically-Controlled AIR VALVE

Meets fully Group D, Class 1, National Electric Code Standards of National Association of Fire Underwriters, for wiring in hazardous locations.

The Bellows Explosion-proof Electroaire Valve is a complete packaged unit; 4-way directional slide valve, independent speed controls, low voltage solenoid controls. Three port sizes: $\frac{1}{4}$", $\frac{3}{8}$", $\frac{1}{2}$". Can be arranged for direct connection to or remote control of any air cylinder of suitable capacity. Write for Bulletin AVX-310. Address Dept. PP352.

"Controlled-Air-Power for Faster, Safer, Better Production"

The Bellows Co.

AKRON 9, OHIO

EXCEL-SO

Combination

SEPARATOR-FILTER-AIR ELIMINATOR

FOR REMOVAL OF BULK QUANTITIES OF WATER, SCALE, ROUGE AND AIR-

SEND FOR DESCRIPTIVE BULLETIN FEQ-51

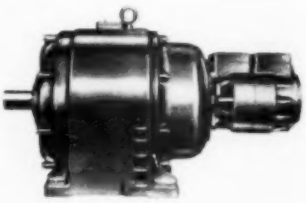
..from Refinery or Gasoline Plant Process Streams, Pipe Lines, Tank Car Loading, Marine Refueling, Truck Loading Racks, Airport Refueling Trucks, and Airport Refueling Systems.

Wherever gasoline or light oils may be contaminated by water, scale, muck, or air—EXCEL-SO can be depended upon to deliver clean, dry fuel.

WARNER LEWIS COMPANY

BOX 3096 • TULSA, OKLAHOMA

What's New!



Explosion Proof Speed Reducer Incorporates Hydraulic Motor

A fluid powered speed reducer makes available all gear ratios of conventional speed reducers with complete control of motor speed from 0 to 2000 rpm., at a constant torque and with full reversibility. Also, according to the manufacturer, extreme torque, down to 1 rpm. is available in the speed reducer. A specially-designed hydraulic motor replaces the conventional electric motor as a power source. The manufacturer states that this fluid-powered unit can be safely trusted to unskilled labor, because there are no rheostats, belts or gears to shift, and power transmission is shockless. This fluid motor is also explosion proof. Made in sizes up to 100 hp. input, larger sizes can be custom built to meet specific job conditions. The model shown in the illustration has a vane-type motor. Piston-type motors will be available at a later date. The Rucker Mfg. Co., 4228 Hollis St., Oakland 8, Calif.

Circle No. **12** *on Reply Card*

Non-destructive Testing Service Sites Increased by Magnaflux

Preventive maintenance is increasingly important for high efficiency in production in refining, chemical processing and many other industries. Non-destructive testing with Magnaflux, Zyglo, and other methods is one of the services now especially needed by many companies. To better furnish the job-by-job inspection where it is needed, Magnflux Corp. has increased the national coverage of its commercial laboratories, from five to eleven locations. They are: Chicago; New York City; Detroit; Cleveland; Hartford, Conn.; Wichita, Kans.; Dallas, Houston, and Odessa, Texas; and Los Angeles and Oakland, Calif. Two phases of inspection are available: laboratory inspection of parts, from 1 to 1,000,000; and field inspection of large objects anywhere. This service is in addition to the regular manufacture and outright sale of equipment by the company. Magnaflux Corp., 5900 Northwest Highway, Chicago 31, Ill.

Circle No. **13** *on Reply Card*

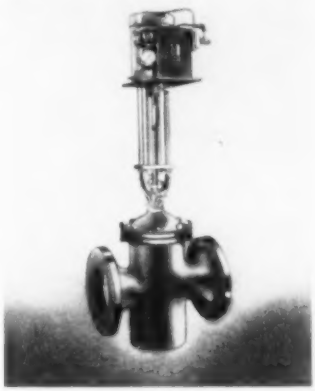
Multi-tube Transmission Avoids Muddle of Separate Air Lines

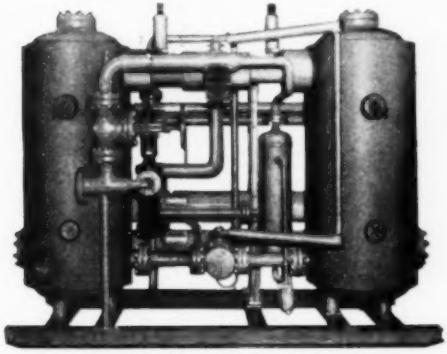
Pneumatic and hydraulic control circuits may now be streamlined through the use of "Armortube" cable, a flexible, protected, multi-tube transmission line. The cable is made of ¼ in. O. D. aluminum or copper tubing gathered in a slow, continuous spiral, similar to the construction of rope. A tube bundle is first wrapped in water-repellent insulating tape, then encased in heavy rust-resistant, galvanized steel strip similar to that used for BX electrical cable. Its main features are: 1) cuts installation time and costs; 2) saves critical materials; 3) protects instrument and control connecting lines; 4) conserves space; and 5) improves plant appearance. Available in bundles of 4, 8, and 12 tubes, "Armortube" is capable of transmitting hydraulic control pressures as high as 3000 psig. and all ranges of pneumatic control pressures, manufacturer states. Connections and take-offs may be made in standard electrical junction boxes. Expensive support racks are eliminated. Standard pipe or conduit clips may be used to fasten the unit to walls or ceilings. A tracer tube easily identifies corresponding tube ends between cable connecting points, since all tubes in a bundle maintain the same position relationship. Bailey Meter Co., 1022 Ivanhoe Rd., Cleveland, Ohio.

Circle No. **14** *on Reply Card*

Valve and Cylinder Principles Combined in Flow Control Piece

A complete line of throttling control valves which utilize principles of "Conoflow Pneumatic Cylinder Operators" and "Paul Venturi Ball Valves" is said to simplify many difficult control problems involving corrosive fluids, abrasive materials, high temperature and high pressure applications. The Paul Valve features a precision ground ball actuated by the Paul venturi ball principle. The streamlined venturi passages and smooth surfaced ball provides a non-turbulent flow stream eliminating cavitation, as well as increasing capacity and improving controllability. Inherently a single seated valve, the Paul principle reduces un-





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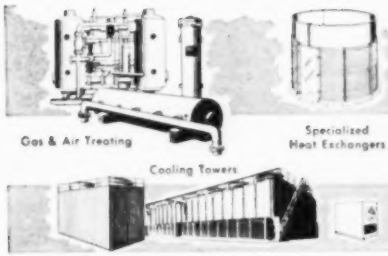
The Pritchard HYDRYER* is *unexcelled* for dependable dehydration of air and other gases for instrument and process controls. Dual adsorbers provide continuous drying action. Standard packaged units designed to reduce dew points to minus (—)40°F. Only service connections are required. Specially designed HYDRYER* units can be tailored to your individual requirements.

*Registered Trade Name



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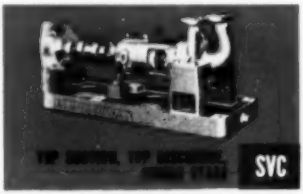
PACIFIC Precision Built PUMPS

are designed and built to operate on 24-hour seven-day-a-week schedule

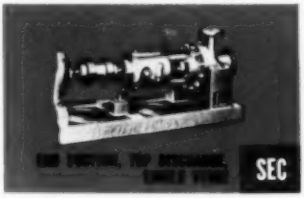
To Engineers responsible for the purchase of plant equipment

Pacific Process Pumps are heavy duty pumps designed to fit your plant – and are fabricated from materials selected for the specific liquid to be pumped.



To Engineers responsible for operation and maintenance of plant equipment

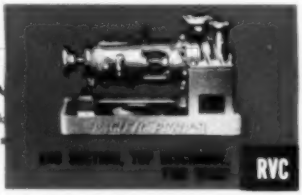
Pacific Process Pumps are heavy duty pumps with *EXTRA QUALITIES* built in – qualities of workmanship and materials that prevent painful loss of production and keep maintenance costs down.



To the Owner of the plant

The value of the *EXTRA QUALITIES* built into Pacific Process Pumps is proved by their performance. The following performance record is typical of hundreds of installations: LIQUID PUMPED – *hot abrasive slurry;* TIME ON STREAM – *26,640 hours;* AVAILABILITY – *100%;* PARTS REPLACED AFTER *26,640* HOURS OPERATION – *wearing rings and shaft sleeves in each pump, impeller in one pump.*

Pacific Pumps inc.
ONE OF THE DRESSER INDUSTRIES
HUNTINGTON PARK, CALIFORNIA
Export Office: Chanin Bldg., 122 E. 42nd St., New York
Offices in All Principal Cities

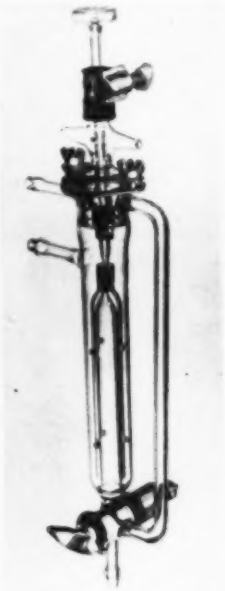


CP 5

What's New!

balanced forces to unusually low values so that the advantage of tight shut-off may be obtained without sacrificing control sensitivity. The straight line relationship between valve lift and flow make the valve highly practical for throttling control service. It is available in sizes to 8" and in a variety of body materials including iron, steel, stainless alloys, and non-ferrous materials. The Conocylinder operator utilizes a positioning mechanism as a component part, thus enabling the assembly to be used in conjunction with standard pneumatic control instruments for automatic control, or with manual loading stations for remote manual positioning. Conoflow Corp., 2100 Arch St., Philadelphia, Pa.

Circle No. **15** *on Reply Card*



Laboratory Vac-Pressure Device Uses Cartesian Diver Principle

Designed for automatic vacuum and pressure control in the laboratory, an all glass, low-cost "Cartesian Manostat" (designated Greiner Cartesian Manostat #71), has been made available. Once a vacuum has been set on the instrument, the system may be shut down without disturbing the setting. It eliminates the necessity of complicated electrical and mechanical systems, or additional equipment of any kind. Its glass construction has the advantage of resistance to corrosion. Emil Greiner Co., 20-26 N. Moore St., New York N. Y.

Circle No. **16** *on Reply Card*

(To obtain more data on advertised products see page 384)

What's New!

Applying Rust-Inhibitive Vinyl Primer Protects Steel Surfaces

"Tygorust" has been specifically developed for commercial use on rusted steel surfaces without the necessity for previous preparation. It is easily applied by brushing, spraying, or dipping. The primer dries quickly and hard, and can be overcoated in a matter of minutes. Adhering firmly to rusted steel, damp or dry, it can be used with any type of finish coating, particularly vinyls. Dry, rusted steel has been successfully primed without wire-brushing; however, for maximum results the surface should be free of grease, oil, and loose scale. U. S. Stoneware Co., Akron, Ohio.

Circle No. **17** *on Reply Card*

Trade Literature

Cleaning through pH Control

The Power of pH Control, Bulletin 114; six-page brochure covering cleaning methods applicable to the petroleum industry in specific jobs under pH control, such as removing heavy deposits of crude oil and grease, rust and scale from heavy equipment, cleaning motors and pumps, compressor heads, valves and machinery parts, railroad tank cars, storage tanks, interiors of heavy fuel oil tanks, and many other cleaning applications from rig to refinery to service station; 32 different cleaning compounds listed with a description as to their most suitable cleaning operation. Kelite Products, Inc., 1250 No. Main St., Los Angeles 12, Calif.

Circle No. **18** *on Reply Card*

Crude as a Diesel Fuel

The Use of Pipe Line Crude Oil As A Diesel Fuel, Bulletin No. 1266; eight-page brochure detailing a system for providing a convenient, low cost fuel for diesel engines in pumping stations, employs a purifier unit consisting of centrifuge, heater, pumps, controls, and instrumentation, with added design for eliminating recontamination; purifier specifications included, illustrated with pictures and flow diagram of the system. The Sharples Corp., 2300 Westmoreland St., Philadelphia 40, Pa.

Circle No. **19** *on Reply Card*

Emergency Power

E-M Synchronizer, quarterly publication Generator No. 200-Syn-35; written by E. W. Kammerer, the article, *How To Get Electric Power for Standby or Emergency Service*, deals with the requirements of standby power, the types of service available, and a detailed discussion of controls for automatic start-stop operation; fully illustrated with diagrams

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PRODUCTS

OIL BURNERS and GAS BURNERS for industrial power, process and heating purposes; STEAM ATOMIZING OIL BURNERS; MOTOR-DRIVEN ROTARY OIL BURNERS; MECHANICAL PRESSURE ATOMIZING OIL BURNERS; LOW AIR PRESSURE OIL BURNERS; GAS BURNERS; COMBINATION GAS and OIL BURNERS; AUTOMATIC OIL BURNERS, for small process furnaces and heating plants; FUEL OIL HEATERS; FUEL OIL PUMPING and HEATING UNITS; FURNACE RELIEF DOORS; AIR INTAKE DOORS; OBSERVATION PORTS; SPECIAL REFRACTORY SHAPES.

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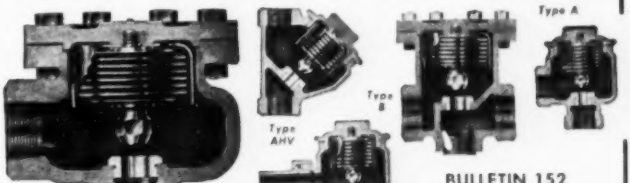

BULLETIN 152
215 Oregon St.
Wilkes-Barre, Pa.

W. H. NICHOLSON & CO.

TRAPS · VALVES · FLOATS

(To obtain more data on advertised products see page 384*)*

and typical installation pictures; other articles discuss turbine generator construction features, and generator size selection to start big motors. Electrical Machinery Mfg. Co., 1331 Tyler St. N. E., Minneapolis, Minn.

Circle No. **20** *on Reply Card*

Mixers for Refiners

Lightnin Mixers, Petroleum Industries Catalog R-101; 16-page booklet illustrates and describes the science of fluid agitation; depicts typical mixing units in oil processing plants and laboratories with space devoted to accessories, side-entering mixers, portable mixers, and top-entering propeller mixers; includes specifications and materials of construction. Mixing Equipment Co. Inc., 152 Mt. Read Blvd., Rochester 11, N. Y.

Circle No. **21** *on Reply Card*

Positive Displacement Pump

De Laval IMO Pumps, Bulletin L313B; four-page folder describing a general service screw-type rotary pump designed for handling petroleum products of viscous fluids in hydraulic systems to 80 gpm capacities, pressure to 275 psi and intermittent pressures to 325 psi; cutaway section, types of mountings, viscosity tables, and dimensions for various frame sizes included. De Laval Steam Turbine Co., Trenton 2, N. J.

Circle No. **22** *on Reply Card*

Continuous Processes

Streamlined Materials Handling In Continuous Production, File No. RP-9000; 16-page reprint of a talk given before the American Institute of Chemical Engineers, describing automatic compounding, blending and mixing equipment applications in a variety of industries including lube oil manufacture, with metering pumps of capacities from 20 cc. to 15 gals./-min. Proportioneers, Inc., Providence, R. I.

Circle No. **23** *on Reply Card*

Chemical Analysis Instrument

The Nefluoro-Photometer; 16-page booklet discusses theory of colorimetric, fluorometric and nephelometric methods of analysis and the combination of these methods into one system in the Nefluoro-Photometer, an electronic-optical instrument; covers information on light sources, absorption cells, filters, assemblies and parts, and accessories. Fisher Scientific Co., 717 Forbes St., Pittsburgh 19, Pa.

Circle No. **24** *on Reply Card*

Turbines

Pyle-National Turbines, Bulletin No. 4110-A; eight pages describing ¼ to 120 h.p. turbines operated by steam, gas, or air, with a speed control centrifugal governor, for mechanical drive; aspects of lubrication, packing, valves and bearings discussed. The Pyle-National Co., 1334 Kostner Ave., Chicago 51, Ill.

Circle No. **25** *on Reply Card*

Instrument Design Changes

Scientific Apparatus and Methods, Winter Edition, 1951-52, Volume Five Section One; 32-page report of instrumentation techniques with the chemical oscillometer, and improvements in design of a heavy duty electroanalyzer. E. H. Sargent and Co., 4647 W. Foster Ave., Chicago 30, Ill.

Circle No. **26** *on Reply Card*

Thermostats

Fenwal Thermoswitch Thermal Controls, Catalog No. 400; 52-page catalog describing the design, operating characteristics and installation of each of the 10 variations on basic thermostatic devices; illustrated with drawings, photos, graphs, and tables with electrical specifications for each model. Fenwal Inc., Ashland, Mass.

Circle No. **27** *on Reply Card*

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BUT FAST—that's how old paint rolls off when you strip tanks the money-saving Oakite way.

Powerful Oakite strippers, applied by hot-flow-on, steam gun, or cold-flow-on method, actually float off paint, dirt and grease. You save time . . . no hand-scraping or chipping. You save money . . . long-life solution may be reclaimed and reused. No expensive sand blasting. And you're safe . . . no fire hazard.

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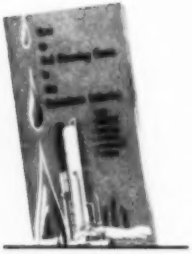

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What's New!

Compressor Motors

Application of Direct-Connected Synchronous Motors to Reciprocating Compressors, Publication No. 1200-TEC-1111; 12-page reprint of a paper presented in December at the New York Section of American Institute of Electrical Engineers, discusses consideration of proper rotor flywheel effect as a preventive measure for voltage fluctuations when driving reciprocating compressors with direct-connected synchronous motors; contains NEMA torque recommendations, formulae, sample calculations, and reference curves. Electric Machinery Mfg. Co., Minneapolis 13, Minn.

Circle No. **28** *on Reply Card*

Scale and Corrosion Control

Organic Methods of Scale and Corrosion Control, sixth edition; 40-page bulletin discusses chemistry of water treatment in boilers and water treatment chemicals used for scale prevention, corrosion control, inhibiting of caustic fracture, prevention of wet steam, foaming or priming, and production of a pure steam from the standpoint of minimum content of undesirable gases; bacterial presence and effects determined by laboratory or field tests. D. W. Haering & Co. Inc. P.O. Box 6037, San Antonio, Tex.

Circle No. **29** *on Reply Card*

Boiler Combustion Control

Bailey Air-Operated Combustion Control For Oil and Gas Fired Boilers, Bulletin No. 1023, Index No. A-716; 24-page booklet graphically presents individual control applications to oil and gas-fired boilers, discusses component controller parts and illustrates typical installations. Bailey Meter Co., 1050 Ivanhoe Rd., Cleveland 10, Ohio.

Circle No. **30** *on Reply Card*

Rust Protection

Rust-Oleum Stops Rust, Form 251; 16-page catalog uses color chips throughout to illustrate the various shades of this rust preventive coating available, with detailed information on applications, resistance qualities, drying time, thinners; questions and answers section and standard packaging information included. Rust-Oleum Corp., Evanston, Ill.

Circle No. **31** *on Reply Card*

Flow Meter Applications

Bristol's "Series 500" Flow Meters, Bulletin F1605; 40-page bulletin describes electrical and mechanical instruments for recording, integrating, indicating, automatic controlling, and telemetering the flow of steam, water, air, gas, oil, solutions, and other fluids; operating principles, primary devices for flow measurement, re-

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Methyl Ethyl Ketone
Ethyl Ether
Isopropyl Ether
Diisobutylene
Polypropylenes
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cording charts, accessories, and sketches of typical applications included. The Bristol Co., Waterbury 20, Conn.

Circle No. **32** *on Reply Card*

Lummus Expansion

Meet the Lummus Company; 16-page brochure illustrates new, modern office building at Houston, describes other Lummus branch offices, laboratory and manufacturing facilities, and foreign affiliates; projected or completed plants illustrated. The Lummus Co., 385 Madison Ave., New York 17, N. Y.

Circle No. **33** *on Reply Card*

Controlling Pyrometers

Sim-Ply-Trol Controlling Pyrometers, Bulletin G-2; four-page folder discussing various heat controlling applications of pyrometers equipped with automatic on-and-off control, automatic alarm and shut-off, and an illustration of a standardized circuit with simplified design which allows for easy inspection and quick servicing; special equipment and applications featured. Assembly Products, Inc., Chagrin Falls 3, Ohio.

Circle No. **34** *on Reply Card*

Petroleum Processing Index

PETROLEUM PROCESSING *Index for* 1951: includes subject and author indexes for all feature articles and regular departments for the 12 issues of this magazine published during 1951. Platt's Petroleum Publications, 1213 West Third St., Cleveland 13, Ohio.

Circle No. **35** *on Reply Card*

General Thompson Testimonial

Freedom's Oil, an address by Lt. Gen. Ernest O. Thompson, Texas Railroad Commissioner, before the American Petroleum Institute, Nov. 7, 1951, at Chicago's Hotel Hilton; an 18-page brochure containing General Thompson's affable remarks on acceptance of API's Gold Medal For Distinguished Achievement,

For Your Convenience

Business reply cards are included in each issue of PETROLEUM PROCESSING to assist you in obtaining more information on any items reviewed in "What's New!" You'll find them facing the first page of this section. Just circle the numbers corresponding to the numbers at the end of each item in which you are interested. Then fill in the bottom of the card and drop it in the mail. No postage required.

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Model "V" is one of many Auto-Lite dial thermometers made for industry. The outline drawings show how this temperature indicator can be adapted to meet specific needs through various standard mountings. Send for our new Catalog No. G-143-B of Auto-Lite dial indicating and recording thermometers.

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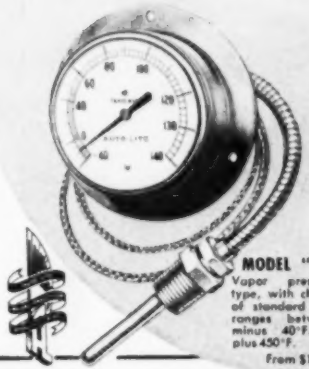

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Vapor pressure type, with choice of standard dial ranges between minus 40°F. to plus 450°F.
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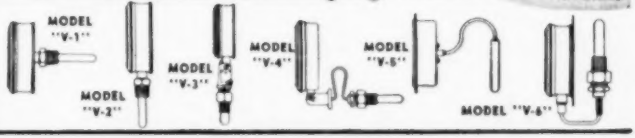

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Prove this to yourself on your own equipment. Write for information on special types and styles of Durametallic Packings for your sealing needs. Ask for Bulletin No. DMPP. Durametallic Corporation, Kalamazoo, Michigan.

(To obtain more data on advertised products see page 384)

which cites his many contributions as a state official to the oil and gas conservation fields; replica of the award can be found inside the cover page on ornate glazed paper. Dresser Industries, Inc., Atlantic Bldg., Dallas, Tex.

Circle No. 36 on Reply Card

Literature Offered in this Issue's Advertisements

Do you need detailed information on a specific subject? Check through this easy-to-use index of literature offered in this issue:

ADDITIVES: heavy-duty detergent/inhibitor type: Technical information offered by Monsanto Chemical Co. See adv't p. 277.

BURNERS: gas or oil, tandem-type: Installed information offered by National Airoil Burner Co., Inc. See adv't p. 288.

CATALYST SUPPORTS: Samples offered by Norton Co. See adv't p. 309.

CHEMICALS: intermediates: Bulletin 100 and Technical Data Sheets offered by Hooker Electrochemical Co. See adv't p. 311.

COLOR CODES: for Pyrometer Wires: Chart offered by Thermo Electric Co., Inc. See adv't p. 336.

CONTROLLER: process: Specification Sheet No. 28 offered by The Minneapolis-Honeywell Regulator Co. See adv't pp. 290-291.

DISPLENDS: magnetic: Catalog 37 offered by Fischer & Porter Co. See adv't p. 287.

COMPRESSORS: reciprocating type: Bulletin No. 118 offered by Clark Bros. Co., Inc. See adv't p. 320.

CONTROL SYSTEMS: all-electronic: Bulletin A-701 offered by The Swartwout Co. See adv't p. 300.

COOLING TOWERS: Bulletins offered by J. F. Pritchard & Co. See adv't p. 378.

CRACKING CATALYST: Data offered by National Aluminate Corp. See adv't p. 310.

DRIER UNITS: for gas and air: Bulletin 16-a-100 offered by J. F. Pritchard & Co. See adv't p. 389.

ENGINE KNOCK: causes: Booklet "Possible Mechanisms by Which Combustion Chamber Deposits Accumulate and Influence Knock" offered by The Dupont Co. See adv't facing pp. 296-297.

EXPANSION JOINTS: Bulletin 15-51 offered by American District Steam Co., Inc. See adv't p. 296.

FANS: cooling tower: Information offered by Hartzell Propeller Fan Co. See adv't p. 266.

FLOW METERS: differential pressure type: Catalog offered by Fischer & Porter Co. See adv't p. 287.

HEAT EXCHANGERS: air-cooled: Bulletin No. FF-501 offered by The Fluor Corp. Ltd. See adv't p. 286.

HEAT EXCHANGERS: air-cooled: Information offered by J. F. Pritchard & Co. See adv't p. 360.

HEAT EXCHANGERS: scraped surface: Bulletin PE-1 offered by Henry Vogt Machine Co. See adv't p. 353.

HEAT EXCHANGERS: sectional bayonet: Bulletin No. 141 offered by The Brown Fintube Co. See adv't p. 293.

INDICATORS: Specification Sheet No. 770 offered by Minneapolis-Honeywell Regulator Co. See adv't pp. 290-291.

INVENTORS: laboratory help: "Inventor's Booklet" offered by Sinclair Research Laboratories, Inc. See adv't pp. 318-319.

LEVEL INSTRUMENTS: Catalog 75 offered by Fischer & Porter Co. See adv't p. 287.

MIST ELIMINATORS: 8-page brochure offered by Metal Textile Corp. See adv't p. 326.

OXYGEN RECORDER: thermal conductivity type: Bulletin 33-320 offered by The Hays Corp. See adv't p. 314.

PACKING: Bulletin No. 15PP offered by Durametallic Corp. See adv't p. 302.

PAINT: rhenium-resistant: Bulletin 720 offered by U. S. Stoneware Co. See adv't p. 277.

PUMPS: vertical multi-stage centrifugal: Bulletin No. 51-sump offered by Byron Jackson Co. See adv't p. 297.

RADIUM: Safety Code offered by Instruments, Inc. See adv't p. 298.

RECORDERS: Specification Sheet No. 760 offered by Minneapolis-Honeywell Regulator Co. See adv't pp. 290-291.

SAFETY: for the small refinery: 12-page book offered by The Dupont Company. See adv't facing pp. 296-297.

SEPARATORS, FILTERS AND AIR ELIMINATORS: Bulletin FEQ-51 offered by Warner-Lewis Co. See adv't p. 291.

STEAM TRAPS: Bulletin 102 offered by W. H. Nicholson & Co. See adv't p. 291.

STEAM TRAPS: Bulletin 150 offered by W. H. Nicholson & Co. See adv't p. 291.

STEAM TRAPS: Data offered by The Clark Mfg. Co. See adv't p. 267.

STEAM TRAPS: orifice: Bulletin T-1710 offered by Yarnall-Waring Co. See adv't p. 292.

SWIVEL JOINTS: ball-bearing: Catalog offered by The Chiksan Co. See adv't p. 350.

TANK CLEANING: 52-page booklet "Tank Talk" offered by The Dupont Co. See adv't facing pp. 296-297.

TANK CLEANING: paint removal: Booklet P7629 offered by Oakite Products, Inc. See adv't p. 305.

THERMOMETERS: Catalog No. G-143-B offered by The Electric Auto-Lite Co. See adv't p. 302.

TUBE FITTINGS: Catalog B-151 offered by Crawford Fitting Co. See adv't p. 396.

TUBES, heat exchangers: Booklet "Alcoa Aluminum Heat Exchanger Tubes" offered by The Aluminum Co. of America. See adv't p. 305.

VALVES, air: Bulletin AVX-310 offered by the Bellows Co. See adv't p. 388.

VALVES, control: Climax Control Catalog offered by Black, Sivalls & Bryson, Inc. See adv't p. 368.

VALVES, pump: New catalog offered by Sims Pump Valve Co., Inc. See adv't p. 393.

VALVES, refinery specifications: Booklet offered by The Rockwell Mfg. Co. See adv't pp. 282-283.

VALVES, safety and relief: "8-Minute Brief" offered by Farris Engineering Corp. See adv't p. 281.

VALVES, steam trap: Catalog offered by Crane Co. See adv't p. 313.

WASTE WATER TREATMENT: Bulletin WC-101 and technical paper "Some Economic Factors in Waste Water Treatment" offered by Graver Water Conditioning Co. See adv't p. 317.

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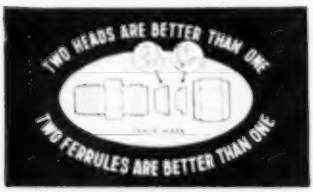

COME TO YOU COMPLETELY ASSEMBLED, FINGER TIGHT

Mr. Fox

A. H. Fox, group leader at Standard Oil Co. (Ind.) Whiting, Ind., has been promoted to research associate in the automotive research division. Mr. Fox began his work with Indiana Standard as an automotive engineer in 1937, and was advanced to group leader in 1944.

He is a mechanical engineering graduate of Purdue University, having received his bachelor's degree in 1928 and his M. S. in 1937. Mr. Fox is a member of the Society of Automotive Engineers and was vice president in charge of SAE diesel activities in 1950.

* * *

Dr. Vladimir Haensel, divisional coordinator of research for Universal Oil Products Co., will receive the $1000 Precision Scientific Co. Award in Petroleum Chemistry. The presentation will take place on April 2nd, during the general session of the 121st national meeting of the American Chemical Society in Milwaukee.

Cited for advancing many practical improvements and innovations in petroleum technology, Dr. Haensel has contributed particularly to the development of platforming, and a practical demethylation process for producing triptane, the super antiknock for aviation fuel.

Dr. Haensel obtained his Ph. D. in 1941, under the direction of **Professor V. N. Ipatieff** of Northwestern University and UOP's high pressure laboratories.

* * *

Pei Moo Ku, formerly an assistant professor at Massachusetts Institute of Technology, has joined the staff of the Engines and Lubrication Section of the National Bureau of Standards. Mr. Ku specialized in internal combustion engines at M. I. T. from 1945 to 1947, and from 1949 to the present time. He received a B. S. in electrical engineering from Chiao-Tung University, Shanghai, China, in 1935, and a D. I. C. in aeronautical engineering from the Imperial College, London, England in 1939.

* * *

Robert T. Haslam has been elected a member of the board of directors of the Dewey and Almy Chemical Co., Cambridge, Mass. He is a widely known chemical and marketing executive and a former vice president and director of Standard Oil Co. (N. J.).

Prior to joining Standard Oil in 1927, Mr. Haslam was professor of chemical engineering at Massachusetts Institute of Technology and is now a member of the corporation of M. I. T. He is a member of the American Institute of Chemical Engineers, serving as president in 1927 and director during the period 1928-31. He is also a member of the American Petrological Institute and the Society of Automotive Engineers.

* * *

There have been four appointments in the research and development department of the Houdry Process Corp.: **Jack C. Dart,** director of Houdry's development laboratory since 1947, named manager of research and development, with **Dr. Alex G. Oblad** as associate manager; **Dr. G. Alexander Mills,** assistant director of research since 1947, is the new director of research; and **Theodore A. Burtis,** chief of the economics section of Houdry's research and development department since 1947, appointed to director of development.

* * *

A. W. Ambrose, president of Cities Service Oil Co. of Delaware, with headquarters at Bartlesville, Okla., became chairman of the board of that company on February 1st. Succeeding Mr. Ambrose in the presidency was **S. B. Irelan,** president of the Cities Service Gas Co. in Oklahoma City since 1944; **Glenn W. Clark** succeeds Mr. Irelan.

Mr. Ambrose

Mr. Irelan

will devote his principal attention to the extensive exploration and production activities of the company in both the domestic and foreign fields.

Mr. Irelan has been associated with Cities Service since 1909 and has been for many years a key executive in the management of various company properties in the electric utility, natural gas and petroleum fields.

* * *

John J. Waybright, assistant to the general superintendent of the Bayway refinery of Esso Standard Oil Co., has been appointed manager of the company's Everett, Mass., refinery. He succeeds **Charles H. Cole,** who has been named assistant manager of manufacturing for Creole Petroleum Corp., Caracas, Venezuela.

Mr. Waybright joined the company in 1934 after being graduated from the U. S. Naval Academy where he obtained a B.S. in marine engineering. In 1942 he joined Esso's manufacturing department and in 1945 was placed in charge of the manufacturing cost analysis group at Bayway. Subsequently he held the positions as manager of technical functions in the manufacturing department, and assistant to the general superintendent.

* * *

Dr. Matthews

Dr. Frederic L. Matthews assumed the duties of technical director of the research section of the Socony-Vacuum Oil Co.'s laboratories at Paulsboro, N. J., on February 22. He was director of research of the Merrimac division of Monsanto Chemical Co., Boston, since 1948.

Associated with Monsanto since 1939 in the organic research department, Dr. Matthews was made associate director of research in the Merrimac division in 1947. A native New Yorker, Dr. Matthews was graduated from Columbia University in 1936 with an A.B. degree. In 1939 he received his Ph. D. from Columbia.

* * *

Harley F. Hardman, research associate in the chemical and physical research division of the Standard Oil Co. (Ohio), has received the Victor Nicholson Award from the Association of Asphalt Paving Technologists, for presenting the best paper at the association's annual meeting in Denver. The title of his paper was: *Some Correlations of Asphalt Composition With Physical Properties.* The choice of Mr. Hardman for this annual award was made by the association's board of directors.

* * *

W. Vaughn Ischie, operating superintendent of Sinclair Refining Co.'s East Chicago, Ind., refinery, has been appointed as deputy director of the Foreign Refining Division of the Petroleum Administration for Defense. Mr. Ischie has been employed by Sinclair since 1920. He was named to supervise cracking operations in the company's refinery in 1929. In 1942 he was appointed to the position he now holds. A native of Cleveland, Ohio, Mr. Ischie attended Case Institute of Technology and Armour Institute, Chicago, and did graduate work at the University of Chicago.

* * *

Kenneth A. McDaniel succeeds **Clyde O. Rowley,** retired, as general superintendent of Standard Oil Co.'s (Ohio) Toledo refinery. Mr. McDaniel

was assigned to this new post after fourteen years of service at Sohio's Lima refinery, where he served in the capacities of laborer, laboratory worker, treating plant foreman, plant process engineer, foreman of the crude stills, coke stills, and process superintendent. He is a chemical engineering graduate of Ohio State University.

* * *

E. R. Lammack, training director at the Beaumont, Tex., refinery of Magnolia Petroleum Co., has been appointed manager of training activities for Socony-Vacuum Oil Co. Inc. in New York. The appointment was effective March 1st. Mr. Lammack will screen training procedures in all company operations. He is a member of both the regional and national committees on refinery training of the American Petroleum Institute.

* * *

Standard Oil Co. (Ind.) has made personnel changes in its manufacturing engineering department: **Wallace B. Matthews** formerly assistant chief engineer in the general office, appointed coordinator of engineering and engineering research; **Wilbur G. Guild,** who has been assistant chief engineer of the company's engineering department at Whiting, Ind., named assistant chief engineer; **Ben Franklin,** formerly assistant to the chief engineer in the general office, also named an assistant chief engineer; and **Robert R. Penman,** who has been head engineer of the engineering department at Whiting, has been appointed head engineer.

* * *

William W. Keeler, vice president and assistant to the executive vice president, Phillips Petroleum Corp., has been named deputy director of the refining division of the Petroleum Administration for Defense, effective March 1st.

Mr. Keeler studied chemistry and mechanical engineering at Kansas University. Leaving the university in 1933, he was employed by Phillips and has served continuously since that time with the company.

* * *

Robert J. Kreuz has joined the staff of the Whiting Research Laboratories of Standard Oil Company (Indiana). Mr. Kreuz received his B.S. degree in chemical engineering from the University of Notre Dame and has recently been associated with the Esso Standard Oil Company.

* * *

John C. Dean, manager of the industrial district of Socony-Vacuum Oil Co.'s New England division, became industrial division manager of the company's lubricating department on February 1st.

* * *

Roy O. Campbell has been appointed chief chemist of British American Oil Co. Ltd. He joined B-A in 1931 and has been technical assistant in the marketing department since 1949. Mr. Campbell is a chemical engineering graduate of the University of Missouri.

* * *

Paul L. Kartzke has been promoted from manager of Shell Oil's Rocky Mountain division to vice president of Shell Oil Co. of Canada, Ltd., and area manager in charge of Shell's exploration and production in western Canada, headquarters in Calgary. He succeeds **E. G. Robinson,** who plans to retire in May.

Under Mr. Kartzke's direction is the new Shell sulfur plant at Jumping Pound, Alberta. A graduate of California Institute of Technology, Mr. Kartzke joined Shell in 1935.

* * *

Henry G. McBurney has been appointed general superintendent of the Baltimore refinery of Esso Standard Oil Co. Mr. McBurney, who has been assistant general superintendent since 1949, succeeds **William J. McClintock,** who at his own request has been relieved because of ill health. **William J. Sheridan,** technical assistant to the process superintendent, was named assistant to the general superintendent.

* * *

Charles P. Baker, manager of the Socony-Vacuum Oil Co. Inc., refinery in East St. Louis, Ill. has become a member of the company's manufacturing committee, headquarters in New York. **Oliver C. Johnson,** who was formerly operating superintendent at the East St. Louis refinery, has succeeded Mr. Baker as manager.

* * *

Gustav Egloff, director of research for Universal Oil Products Co., has been named honorary chairman of the Second International Art Exhibit, planned as part of the Seventh National Chemical Exposition. The Exposition will be held in the Chicago Coliseum Sept. 9-13.

* * *

Harold M. Trimble, associate director of research, Phillips Petroleum Co., has been reappointed to the subcommittee on aircraft fuels of the National Advisory Committee for Aeronautics.

* * *

Dr. Raymond Halik, development engineer for Socony-Vacuum Oil Co., has been temporarily transferred from the Paulsboro, N. J., laboratories. He is to attend a one-year training program in "Reactor Technology and Design" at the Oak Ridge National Laboratories.

* * *

R. W. Faulk, recently associated with Shell Oil Co.'s head office personnel organization in New York, has been appointed manager of manufacturing with Shell Oil Co. of Canada, Ltd., headquarters in Toronto.

* * *

George E. Merkle, vice president and general manager of Fiske Bros. Refining Co., Newark, N. J., has been selected as president of the National Lubricating Grease Institute for 1952. He has been with Fiske Bros. since 1921 in the capacities of chief chemist, plant manager, technical director, general manager, and now vice president and general manager. Mr. Merkle is a graduate of the University of Massachusetts.

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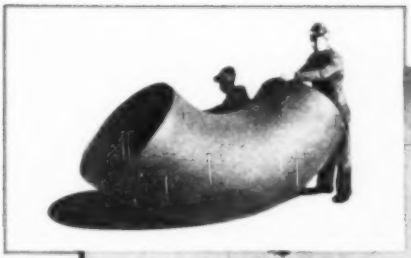
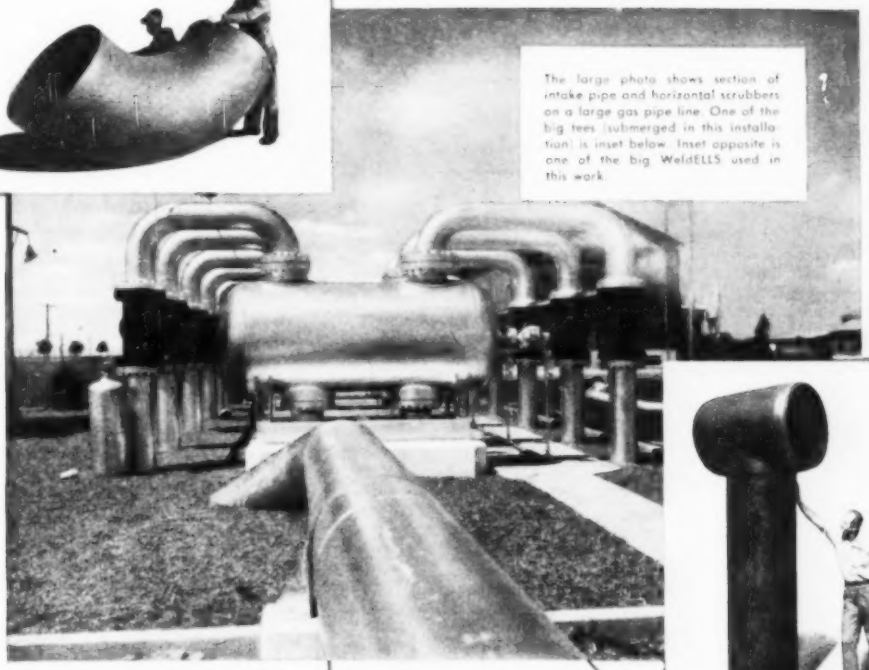
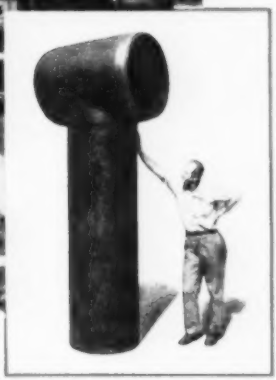


The large photo shows section of intake pipe and horizontal scrubbers on a large gas pipe line. One of the big tees (submerged in this installation) is inset below. Inset opposite is one of the big WeldELLS used in this work.





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EDITORIAL VIEWPOINTS

Opinions and Comments on Current Topics

Union Casts Itself In New Role — Promoter of Technological Advance

A RECENT resolution of the CIO oil workers' union, to bolster its demands on the oil companies for higher wages, states "vast technological advances and increased skills on the part of workers have substantially increased the productivity of the industry". This statement was put out entirely for public consumption and is typical of the unions' misrepresentation of the facts in presenting its issues.

Continuing, the resolution states: "We find that in the face of generally rising costs, the oil and allied industries actually have been able to reduce production costs because of this increased productivity. . . . This union has never stood in the way of technological advance. We have never objected to labor-saving devices. Our members have contributed many of the ideas and inventions which have increased productivity. . . ."

Those familiar with plant operations know this is an entire falsehood as far as the refineries and natural gasoline plants are concerned. Oil companies' records have not turned up a single instance of a concerted union effort or program to increase plant productivity or advance the industry's technology. In fact, the opposite is happening where the unions are strong in a refinery. Jurisdictional work disputes and petty issues slow up the worker's productivity.

However, it behooves industry and its spokesmen on every occasion to rebut the union's false claims. Similar statements have been made as related to the automotive and other manufacturing industries. They are part of the unions' efforts to take for themselves at least part of the credit for the technological advances of the past two decades which have really come about through the intensive research programs which the petroleum and other industries have supported.

The oil companies now invest at the rate of over $100,000,000 annually in research work. It is here that the new processes and methods are worked out which are later applied in the refineries to improve product quality and reduce manufacturing costs. To mention the most outstanding developments, the so-called "catalytic revolution" which has so greatly improved the processes in use today stemmed from the wide-spread application of catalytic operations to cracking, which in itself made possible higher yields and quality in motor fuel. As research men became more familiar with catalysts they were developed for such processes as hydroforming, polymerization, alkylation, hydrogenation and desulfurization, all important new methods in petroleum refining.

The manufacture of lubricating oils by solvent refining, as developed in the oil company and engineering company laboratories, made it possible to produce high grade lubricants from almost any grades of crude. The old methods of refining lube oils by settling and filtering selected crudes could not have produced the volume of quality products needed to keep today's automobiles on the road and the nation's industrial plants in operation. Organized labor had no part in these achievements.

Engineering and design improvements worked out by the technical staffs of the oil companies have greatly increased the design capacity of operating units and thereby lowered the unit cost of production. Catalytic cracking units today are designed with 60,000 b/d capacity as against 10 to 15,000 b/d in plants built less than 10 years ago.

The general installation of automatic control features in these modern operating units, which are entirely engineering features, makes it possible to operate these units with the same number of skilled operators as the former smaller-scale units. Product quality is greatly improved, and loss of oil reduced, as compared with manually operated plants.

The removal of operating bottlenecks in the plants, another engineering improvement, has made it possible to greatly increase the actual throughput of the refining plants and in many instances allow them to run at greater than their design capacity. More oil is shoved through pumps and pipe lines and through furnaces without changing the original capacity of the units. The result, all told, has made it possible for U. S. refineries in recent years to operate at from 90-95% of operable capacity, while prior to the war 75-80% operating rate was considered a good figure. These improvements have come about through the attention of management to putting into effect the engineering developments worked out in the laboratories of the oil and equipment companies, and in no wise to increased productivity of labor.

This is the story which the oil industry should be telling to give the lie to these false union claims that "increased productivity" is the result of "vast technological advances and increased skills on the part of the workers."

Within the past few years, the American public has come to have some understanding of what science and technology as applied industrially is doing to improve its every day living. The achievements have been so dramatic they are being told in magazine articles, through movies, or over radio, and in the advertising of the oil, chemical, steel and other leading industries. Scientists with the oil companies talk more frequently on the subject before many kinds of audiences. The recent statement of the oil unions may come from a belated effort to falsely take credit for a development they recognize is catching the public's attention, but in which they have actually taken no part.

Whatever the cause of the new role the unions would take as promoters of improved technology, the oil industry should redouble its efforts to show the achievements have actually come entirely from stimulated research and engineering developments.

—V.B.G.

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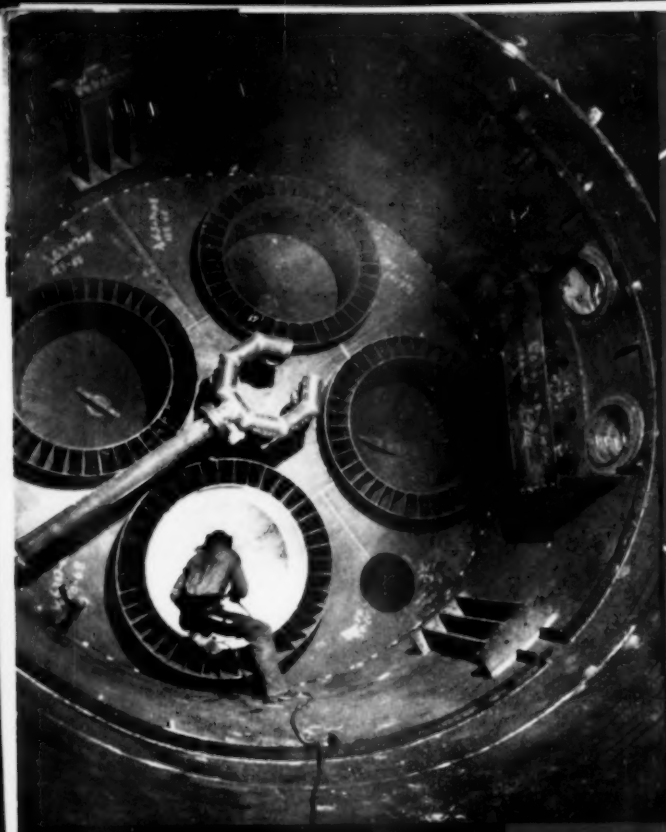

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